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COVER STORY

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Generalthema: Zukunft gestalten

Düsseldorf, 14.-17.11.2016
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Veranstaltungstag	Raurn		
	L	M	R
Montag 14.11.2016		10.00 Uhr - 12.00 Uhr Auftaktveranstaltung **Zukunft gestalten** 13.00 Uhr - 16.30 Uhr **Das G·DRG-System 2017**	
Dienstag 15.11.2016	10.30 Uhr - 14.30 Uhr KH-Träger-Forum **Zentrale Hausforderungen für das Krankenhaus** 10.30 Uhr - 12.00 Uhr Teil 1 **Investitionen für Zukunftssicherung** 13.00 Uhr - 14.30 Teil2 **Demographiefeste und kultursensible Krankenhäuser**	10.00 Uhr - 12.00 Uhr **Budgetverhandlungen 2017** 14.00 Uhr - 17.00 Uhr IT-Entscheiderfabrik **Unternehmenserfolg durch optimalen IT- Einsatz**	10.00 Uhr - 13.00 Uhr BDI-Symposium **Qualitätsindikatoren und Indikationsqualität** 14.30 Uhr - 17.00 Uhr **KHSG -Umsetzungs - Monitoring** (Qualitätsoffensive und Finanzierungsvorgaben)
Mittwoch 16.11.2016	10.00 Uhr - 13.00 Uhr BMVZ-Veranstaltung **Rentabilität von Krankenhaus -MVZ: Praxisseminar zu Benchmarks & Cantrolling für die amulante Versorgung** 14.00 Uhr - 16.00 Uhr VKD-Forum mit Work-Café **Haftungsfalle Management** 16.30 Uhr - 18.30 Uhr VKD-Mitgliederversammlung	10.00 Uhr - 12.00 Uhr **Fachtagung Patientenfürsprecher Dialog und Patientenzufriedenheit im Krankenhausalltag** 14.00 Uhr - 18.00 Uhr Vortragsveranstaltung Architekten **Der Architekt als Dialogpartner - als Zukunftsmodell geeignet?**	10.00 Uhr - 14.15 Uhr Forum "Pflege im KH" **Fit für die Zukunft** 15.00 Uhr - 17.30 Uhr DVKC-Veranstaltung **Update Controlling** 18.00 Uhr - 20.00 Uhr VLK-Forum **Korruption im Gesundheitswesen: Sind alle Ärzte potentielle Täter?**
Donnerstag 17.11.2016	10.00 Uhr - 17.00 Uhr EAHM-Veranstaltung	10.00 Uhr - 12.30 Uhr P.E.G Veranstaltung **Boundaryless Hospita!: Vision oder Zukunft?**	10.00 Uhr - 12.30 Uhr IT-Entscheiderfabrik **Start Up & Young ProfessionalPreis**

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IF YOU BUILD IT, WILL THEY COME?

Aaron Sklar

VP Design at Welltok, Inc.
Co-founder of Prescribe Design, USA

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On the first day of a new project, I often discover that many of my colleagues in healthcare haven't worked with designers before, which is why I'm introduced as "an IT guy." While I was initially startled to be stereotyped as "IT", I have come to realise that IT is exactly the right place for a designer to be.

We've entered a new age where technology should be defined not by its mere existence, but by its usability and design. Too often, healthcare technology is implemented with little regard for the people who will actually use it every day. We should be designing for people. As Vice President of Design, at Welltok, Inc. my goal is to bring elegance and personalisation to healthcare technology. I need technology, the same way an artist needs a canvas, but my goal is usability.

The key is empathy for the end-user. To change healthcare, we must first understand the different behaviours and needs of patients, physicians, payers and employers. When I'm designing, I always abide by three main principles:

1. **Build to Think: What does the end user want?** It's important to prototype early and often throughout the design process, asking real people the right questions. Recently, my team hit the streets of San Francisco, asking commuters questions like "What is your secret to good health?" and "What was the best interaction you've had with your doctor?" The answers helped us better understand how the average person uses the healthcare system, how they want to use it, and how we can design to fit those needs.
2. **Design as the Engager: Patients are no longer passive bystanders.** The future of healthcare depends on consumers taking control and proactively managing their health – and the key to help them get there is an experience that is convenient, engaging and enjoyable. Design plays a critical role in driving better patient engagement, clinical quality and controlled costs.
3. **Design as a Competitive Advantage: Providing technology isn't enough.** Healthcare companies following the mantra of "if you build it, they will come" are falling behind, because the challenge is not just to build it, but build it better. Think of technology the same way you think of customer service. When you analyse the competitive landscape as a designer, the result is that technology fades into the background. What you're left with is an experience, and if you've designed it correctly, the friendliest, seamless and most positive experience possible.

Healthcare is in the midst of a wave of technology launching the industry forward. As the obvious advantages of technology are being realised, the next wave coming to healthcare is design: tools and experiences that truly empower patients and providers. I'm excited to be part of that wave, and there's no better place to do it than embedded with my "IT guy" colleagues. ■

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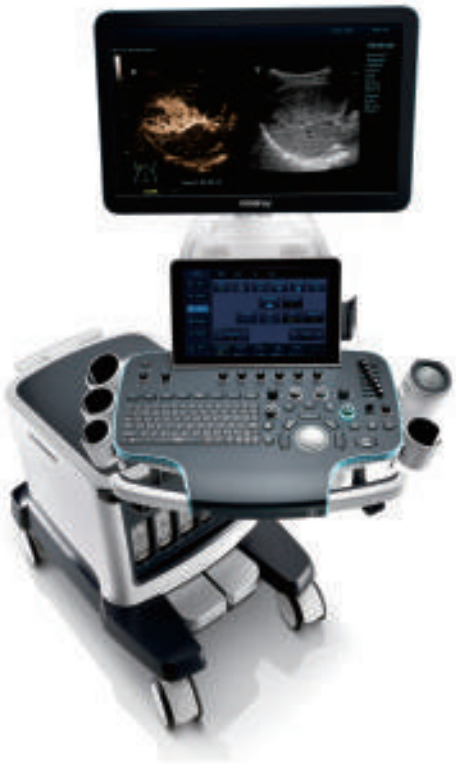

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INFORMATICS DRIVES RADIOLOGY TODAY

INTERVIEW WITH HASSEN A. GHARBI

Hassen A. Gharbi

Professor of Radiology and Biophysics, Tunis

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Hassen A. Gharbi from Tunisia was recognised at ECR 2016 in Vienna for being "the first paediatric radiologist in northern Africa" receiving the honorary membership exactly 50 years since he graduated from France. In his brief acceptance speech, Dr Gharbi praised members of the European Society of Radiology for their support all these years, in particular former ESR president Dr Guy Frija, and pledged that he will continue to do "what I did all my life with enthusiasm."

In an interview with *HealthManagement.org*, Dr Gharbi displayed his humble side, dedicated to promoting radiology and safety in public health throughout his career of five decades, evident in his people-centric character.

How different is radiology today from 50 years ago? What would you say was the biggest achievement in this technology?

In my view, the main achievement in medical imaging during the last 50 years has been the extraordinary development of informatics in our radiological daily life: preparing our reports, new imaging modalities, digitisation, training, telemedicine, etc.

It was impossible in 1968, when I graduated in Paris, even for the greatest visionary of men to imagine the situation we have today.

During my professional life, I have witnessed three main new modalities introduced in the radiology field: ultrasonography, CT scanners and MRI.

In developing countries, where more than 50 percent of the world's population has no access to any imaging modality, ultrasonography is the most important tool introduced in the medical imaging diagnosis, epidemiological and guided treatment fields.

I had the chance, for which I was considered a pioneer, to introduce this technology in my country back in 1978, but also at the early stages of the sector in Africa and as a board member since 1991 of the World Federation for Ultrasound in Medicine and Biology (WFUMB), in several areas in the world, mainly in Africa, Central and South America, and Asia.

Ultrasonography is a wonderful tool, not expensive, easy to use and easy to promote. My generation had the chance and the privilege to introduce this technology, to describe the findings in different pathologies and to prepare the guidelines for the best use of ultrasound for the benefit of our patients.

Personally, I had the chance, with my colleagues in Tunisia, to establish the classification of the hydatic disease, in 1981, published in *Radiology*, and still used around the world. We promoted – and the World Health Organisation adopted – our strategy for using ultrasound as epidemiological and diagnostic, and guided the treatment for several diseases such as hydatidosis, bilharziosis, etc.

It has been a wonderful adventure for me and for my colleagues around the world to build the foundations for the good use of ultrasonography and to try to avoid its misuse, which could turn out to be very dangerous for our patients. Till now, we continue to work in the same direction. Unfortunately, even today, more than half of the world population does not have access to any imaging modality. This is an unacceptable situation with catastrophic repercussions, but this is a reality and it is our duty to fight on to overcome this problem.

> "THE FIRST PAEDIATRIC RADIOLOGIST IN NORTHERN AFRICA"

Where would you like to see new technological achievements?

In radiology congresses every year, we observe new techniques and new tools developed by researchers and by companies around the world. For me, the most important is to develop technologies that would allow taking care of patients in poor areas and in rural areas, everywhere. The Internet is a very common tool and available around the world, so, today, teleradiology seems to me the most promising tool in my dreams

You mentioned Dr Guy Frija (a leading member of our Editorial Board) in your acceptance speech. Can you elaborate?

Professor Guy Frija is a great man because of his humanity, efficiency and being an excellent visionary for the future of radiology in all its aspects – technique, strategy, promotion in the developing world. I met Prof. Frija in the early 1990s

when he was General Secretary of the French Society of Radiology. We started a great and productive relationship between the Tunisian Society of Radiology, which I headed, and the French society that resulted in a French-Tunisian collaboration agreement in the field of radiology. Today, more than 160 Tunisian radiologists attend the all-important Journées Francaises de Radiologie each October, the most prestigious Francophone congress in the world. This cooperation was the starting point for future agreements between the Moroccan, Algerian, Lebanese, Syrian and of course the French Society of Radiology. More than that, Guy suggested the creation of the African Society of Radiology as an international body, which I did with the help of several colleagues from France, Libya, Tunisia, Kenya and Uganda. Next year, we will have the fourth African Congress of Radiology under the auspices of the International Society of Radiology, the European Society of Radiology and the French Society of Radiology. I thank Guy for the advce he has given us all these years and to help me realise several of my dreams.

How important has the ESR contribution been to improving quality of healthcare in Tunisian hospitals, both on the side of technological development and also education of young radiologists?

This is an important question. Over time, the ESR boards have offered free membership for Tunisian radiologists, but the main obstacle has been the language barrier. Tunisia is an Arabic speaking area, French is our technical language and English is the third language used every day. However, the number of Tunisian participants, radiologists and companies at congresses is growing very fast; around 70 Tunisians participated in ECR 2016.

ECR is a great meeting for us. It is very attractive, easy to access (2-hour direct flights) and greater collaboration is expected in the future, mainly in the field of education.

Where, can you say, is the biggest problem in Tunisia or North Africa today?

Tunisia may be considered a poor country with a per capita GDP income of US$ 4,230 PNB and a population of 11 million, but not so poor when it comes to the medical sector and scientists. We have more than 750 radiologists, graduated and trained in Tunisia, and four medical schools. This is great number compared to other Africans countries. However, our main need is the constant training of our radiologists, through visiting programmes for professors from Europe or the United States and scholarships for our doctors to explore different new fields, such as interventional radiology.

Is there "talent" in Tunisia and North Africa, and if so, what advice would you give young medical students?

Good question. I am proud to say that, yes, we have talent in Tunisia and North Africa. Great names are now working in France and in the US, and in different fields, who have had their basic training in Tunisia. My advice to young medical students is that radiology is a wonderful world, they have to work hard and even be ambitious, as the promising future offers unlimited guarantees.

Hassen Gharbi receiving the honorary membership in Vienna from ESR President Dr. Lluis Donoso Bach and ECR Congress President Katrine Riklund

Who inspired you to follow this profession?

My father and my family pushed me into the medical field. My father was a farmer, a great worker, but with limited education. However, he had a great vision. So, I studied biophysics and medicine and became a biophysicist and radiologist.

How important is it to have state-owned vs. private hospitals or diagnostic centres? Which one is more efficient?

I had the opportunity to work very hard, 14 hours a day, in the public hospital and I am now in a private centre. All the time, I was happy and satisfied simply to accomplish my different tasks: clinical, research and teaching. I have no regrets at all. I had the great privilege to have fantastic colleagues from France and Tunisia working with me, and the cooperation with organisations in France, the WHO and IAEA, that provided me with a budget, equipment and scholarships for my three hats: paediatric radiology, biophysics and radiation protection.

I believe the situation today is very different and such facilities are difficult to obtain.

There is no difference in my view between public and private structures – we just need to be hard workers and happy and proud during our work. In the private sector, you can earn more money, while in the public sector there is greater satisfaction of achievement and more honor. But the main pleas-

PROFILE: Hassen A. Gharbi

Hassen A. Gharbi is a professor of radiology and medical biophysics from Tunis, Tunisia. He was head of the department of radiology at Tunis Children's Hospital and head of the medical biophysics department at Tunis Medical School. He is the immediate past president of the World Federation for Ultrasound in Medicine and Biology (WFUMB) and the African Society of Radiology (ASR).

He obtained his medical degree in 1966 from Paris Medical School, where he subsequently specialised in radiology, aeronautic medicine, medical informatics and medical biophysics. He completed a PhD in optic physiology at the Orsay Science Faculty in Paris, and two decades later graduated in Management of Radiation Accidents from Oak Ridge Associated Universities, Tennessee, USA.

Prof. Gharbi worked as an assistant professor at the biophysics department of Paris Medical School between 1966 and 1970, before being appointed vice dean of Tunis Medical School in 1971. In 1970, he created the first paediatric radiology department in North Africa at Tunis Children's Hospital, which he later headed.

Prof. Gharbi is the founder and first president of the Mediterranean and African Society of Ultrasound (MASU) and also founded the Tunisian National Centre of Radiation Protection, serving as its director between 1971 and 1989.

Between 1975 and 1985, he was president of the Radiological Tunisian Commission of the Ministry of Public Health, to which he also acted as adviser on radiology, paediatric radiology, biomedical engineering, radiation protection, training and hospital equipment planning.

He has served the World Health Organisation as an expert in radiology, radioprotection and paediatric radiology since 1993.

Prof. Gharbi is retired but is still involved in several teaching programmes, mainly to promote the good use of ultrasound in developing countries around the world.

His other main interest was imaging of hydatid diseases and the study of their epidemiology and treatment. His ultrasound classification of the hydatid cyst appearance published in *Radiology* in 1981 is still used around the world.

He has authored or co-authored more than 20 books on paediatric radiology, and tropical and infectious diseases (hydatid diseases), and has published more than 130 articles in national and international journals. He also sits on the editorial boards of several international journals.

Prof Guy Frija – "a visionary and close friend of Tunisia and North Africa"

"RADIOLOGY IS A WONDERFUL WORLD, YOUNG PEOPLE HAVE TO WORK HARD AND EVEN BE AMBITIOUS, AS THE PROMISING FUTURE OFFERS UNLIMITED GUARANTEES"

ure is to be proud of what you do, to take care of patients and to save lives no matter if you are in the public or private sector. The pleasure is the same.

How important is it to have modern management methods in your profession?

Today, there is no question of choice – it is obligatory to be modern in your professional life, there's no doubt at all. Every day we have to learn more things, so we need to have a team working together. In all my life I have had real friends working together for the best use of our equipment and the best care of our patients.

If you were not a radiologist, what would you be today?

My dream was to be an engineer, in the agriculture or in the electrical field. But, when I look back at my life, I realise being a radiologist and biophysicist was a great calling. I am a very lucky man. ■

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Nietzsche said, "*All great things must first wear terrifying and monstrous masks in order to inscribe themselves on the hearts of humanity*". Unfortunately, for the health sector the issues of ransomware, malware and hackers must worsen before things improve. This is not a sadistic estimation; rather, it is a prediction that the healthcare communities victimised by cybersecurity attacks will not be galvanised to action until significant impact has already occurred. Sadly, only after the threat is tangible, and the attack surface left unobscured will organisations shift their culture to address the threats looming on their threshold.

The latest digital epidemic to take the healthcare sector by storm is crypto ransomware. Ransomware is nothing more than weaponised encryption. It is unique in cybercrime because in order for it to be successful, it requires the victim to become a willing accomplice after the fact. Ransomware is dangerous because it requires virtually zero technical aptitude so practically anyone can do it. Healthcare organisations, which used to be off-limits to cyberadversaries, are now the primary targets of many cyberthreats. This shift occurred recently, when healthcare organisations began digitally retaining more customer data, and when hospitals such as Hollywood Presbyterian hospital began to pay to end ransomware and other attacks.

The Threat: Facts

There are two primary cyber-criminal groups that capitalise on these unique attack vectors against hospitals; script kiddies and hackers for hire (aka Mercenary Hackers). Script kiddies are the toxic, parasitic 'hacker wannabes' clinging to the fringes of dark web forums. They possess limited, if any, tech sophistication and wreak havoc on the global population by spamming ransomware without any particular target. They are able to capitalise off of the few people that fall for the spoofed emails that read as if they are coming from online retailers or payment systems, for example. On the other hand, Mercenary Hacker Teams are usually technologically sophisticated and precise in their selection of victims. They write their own multi-tiered code, and they have more structured agendas behind their attacks. They may use ransomware as a diversionary tactic to create organisational chaos at the premises of their target while simultaneously penetrating the network from another angle in order to exfiltrate sensitive data, only to manipulate remaining data when their mission is accomplished. Whether the ransom is paid or not paid is not their true motivation; instead the exfiltration, manipulation, or destruction of valuable sensitive data is their primary aim. They repeatedly and systematically monetise stolen information over and over again on multiple dark web

forums to endless clients who stem from an infinite variation of motivations.

Sophisticated hackers will target organisations deficient of at least a general baseline: the lack of cyber hygiene, the prevalence of bureaucratic siloes that host unique inter-organisational political feuds, the dependence on an IT team instead of a qualified info-sec team for cybersecurity, and most importantly, hackers will target organisations where employees are under-appreciated, over-worked and under-paid. Organisations with these characteristics will be targeted and in most cases, adversaries will succeed in the attack.

In short, the adversaries are numerous, the attack vectors are hyper-evolving, and the stealth and sophistication of even upstarts in the hacker sphere are becoming even more creative and devastating. In this type of environment, fear mongers are omnipresent and will attempt to offer silver bullet solutions to fearful organisations. Make no mistake; there is no silver bullet solution to the vast hacker and script kiddie conundrum. Instead, a layered defence is the only meaningful method of defence. A persistent attacker will breach any defensive perimeter. It is important to realise that you cannot keep a breach from happening; you can only detect and respond to threats. The good news is, many technologies exist that can severely minimise your organisation's attack surface in order to thwart threat.

> "ADOPTION OF AN INFORMATION SECURITY TEAM IS HOW ORGANISATIONS EVOLVE. THE HEALTHCARE SECTOR IS KNOWN FOR ITS GLACIAL PACE OF REFORM"

Dealing With the Threat

First, give your IT team a break. Chances are, they are not qualified to maintain your organisations cybersecurity posture and it's time to bring in a cybersecurity team whose sole purpose is information security. Organisations that are too small or lack the financial resources to hire a dedicated team, need to lease a team or license the services of a credible vendor.

The first thing the infosec team will do is run a risk assessment on your organisation and patch vulnerabilities immediately. They will educate staff on the latest threats and how to mitigate vulnerable systems. Then they will create policies and procedures that are security-centric, they will audit third parties who have access to your network for cyber hygiene, and they will report their findings and progress to the board quarterly.

From a technical perspective, they will introduce a layered cyberdefence that will evolve with emerging threats within the industry. They will implement layers such as endpoint security, ongoing patching, continuous penetration testing, user behavior analytics and other user/network abnormality detection mechanisms, encryption of data that is in transit and stationary, threat intelligence and least privileged user credential policy among staff and most importantly, they will begin backing up data in real time. The information security team will do everything that they were trained to do to prevent intrusions in the network and to remove threats before incidents occur.

The Time to Act is Now

Organisations must evolve with the threat and make use of technologies that already exist in order to combat the legions of invisible adversaries who are continuously analysing and testing their networks for exploitable vulnerabilities. Adoption of an information security team is how organisations evolve. The healthcare sector is known for its glacial pace of reform. In the next year or two, organisations which fail to adopt an information security team will become notorious in the community as the organisations that succumbed to an incident.

For long-term defence across the healthcare sector there must be a renaissance in cybersecurity that promotes cyberhygiene and a security-centric organisational culture that is continuously reinforced by peer pressure. If the community expectation rises to include information security as a requirement, then additional regulation will not be needed and attackers will divert to easier targets in other sectors. If organisations fail to adapt to the looming threat, then more predatory adversaries will flock to the vulnerable prey and the only way to halt the barrage of attacks will be drastic regulation-based reform. ■

Key Points

- ✓ Healthcare is now a key target of cybercriminals.
- ✓ Generally, there are two types of hackers; unsophisticated Script Kiddies and tech savvy Mercenary Hacker Teams.
- ✓ Securing a ransom is not the main aim of hackers; extracting data for repeated monetisation is.
- ✓ Cybersecurity is too stressful for the average IT team. Healthcare facilities need to engage information security experts to protect against cyber attacks.
- ✓ Failing to adopt the right professionals will seriously compromise an organisation's reputation.
- ✓ Without adoption of proper security, severe regulation-based reform may be the only option.

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Cardiovascular and Interventional Radiological Society of Europe

BREAST CANCER SCREENING ACCURACY

DOES CHANGING THE ORDER OF SECOND MAMMOGRAMS REDUCE DETECTION?

A study in the UK, where two film readers independently evaluate each mammogram for signs of cancer, has found that changing the order of examination between two sets of readings did not result in any significant difference in detecting breast cancer.

The study, published in *The Journal of The American Medical Association* (JAMA), found that the interpretation of batches of mammograms by qualified screening mammography readers using a different order against the same order for the second reading resulted in no significant difference in rates of detection of breast cancer.

> "THE INTERVENTION DID NOT INFLUENCE CANCER DETECTION RATE, RECALL RATE, OR RATE OF DISAGREEMENT BETWEEN READERS"

False-Positive Recalls And Missed Cancers

Characteristics of cancer are disguised among background breast parenchyma (tissue) resulting in false-positive recalls and missed cancers, which makes interpreting screening mammograms a difficult and repetitive visual search task.

In similar tasks, a vigilance decrement (decreasing detection rates with time on task) has been observed in a large number of psychological laboratory experiments, including assembly line inspection tasks and airport baggage screening.

Sian Taylor-Phillips, Ph.D., of the University of Warwick, Coventry, and colleagues investigated whether a vigilance decrement to detect cancer in breast screening practice exists and whether changing the order in which two experts examined a batch of mammograms could increase the cancer detection rate.

The survey included data from 360 readers at 46 specialised breast screening centres from the National Health Service (NHS) Breast Screening Programme in England for a year. Two readers examined each batch of digital mammograms in the same order in the control group and in the opposite order to one another in the intervention group.

Among 1,194,147 women who had screening mammograms (596,642 in the intervention group; 597,505 in the control group), the images were interpreted in 37,688 batches (median batch size, 35), with each reader interpreting a median of 176 batches. After completion of all subsequent diagnostic tests, a total of 10,484 cases (0.88 percent) of breast cancer were detected. There was no significant difference in cancer detection rate with 5,272 cancers (0.88 percent) detected in the intervention group vs 5,212 cancers (0.87 percent) detected in the control group (recall rate, 4.14 percent vs 4.17 percent; rate of reader disagreements, 3.43 percent vs 3.48 percent).

"The intervention did not influence cancer detection rate, recall rate, or rate of disagreement between readers. There was no pattern of decreasing cancer detection rate with time on task as predicted by previous research on vigilance decrements as a psychological phenomenon," the authors write. ■

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HEALTHMANAGEMENT.ORG'S MOST CLICKED STORIES

Every week *HealthManagement.org* publishes top healthcare management, leadership and best practice news in dedicated newsletters. We know you're busy, so we do all the work and pick the best stories to send you. Read on for a variety of topics that piqued record interest recently.

5 Ways to Improve ICU Rounds

Based on a survey of practice in 111 Canadian ICUs, the authors of a study published in PLOS One have recommended 5 ways to improve ICU rounds, and produced a 1-page patient care rounds guide for intensive care teams. It includes points such as team composition, managing interruptions, role of patients and families, incorporation of teaching during rounds and developing evaluation measures. Team make up and time and length of rounds also played a role in the study. See more at **https://iii.hm/30f**

IT Lack of Resources Frustrates Healthcare IT Security

Electronic health records (EHRs) and digital clinical systems have widely been deployed in healthcare without strategic data and IT infrastructure security planning, a report by HIMSS Analytics and Symantec Corporation said. Out of 115 hospital IT and security personnel polled, the majority devote less than 6 percent of IT budgets to and seventy-two percent of respondents said they have five or fewer IT employees allocated for data security. See more at **https://iii.hm/3ay**

Robots in Healthcare "in 20 years"

A robotics designer has said within 20 years robots could be serving in a number of fields including healthcare. Meanwhile parts of the science community have expressed worries about how artificial intelligence could threaten humanity in the next millennia. Google has set up an ethics board to oversee its work in artificial intelligence being developed by several robotics companies it owns. The objective is to ensure projects are not abused. See more at **https://iii.hm/3az**

Can Worksite Intervention Reduce Cardiac Risk?

The Trans-Atlantic Network to Study Stepwise Non-invasive imaging as a Tool for Cardiovascular Prognosis & Prevention (TANSNIP), the Progression of Early Subclinical Atherosclerosis trial began in January and will evaluate whether worksite interventions result in a reduction in the prevalence of cardiovascular disease risk factors that are related to lifestyle. *HealthManagement.org* spoke to the study's chair, Prof. Valentin Fuster who said the study uses the BEWAT (**B**lood pressure, **E**xercise, **W**eight, **A**limentation, **T**obacco) score to measure outcomes, because it gives the information required without the need to take blood. See more at **https://iii.hm/3b0**

Donning Scrubs for Teamwork

Administrators, board members and reporters donned scrubs for a typical working shift at Mission Health's innovative Immersion Day programme to create new paths for key stakeholders to better understand the real challenges and opportunities facing health systems. Called "Immersion Day – Transforming Governance and Policy by Putting on Scrubs," the programme – now in its third year – has improved insights on how to lead, regulate and report on the most complex health care issues. See more at: **https://iii.hm/2yb**

Body Language Critical During Breast Cancer Chemotherapy

A new study is tracking the development process and efficacy of the Italian translation of the Derriford Appearance Scale 24 (DAS24), an important clinical tool in identifying quality-of-life issues for breast cancer patients. Experts have expressed the need for a 'gold standard' when measuring a patient's distress towards their appearance. See more at **https://iii.hm/3b2**

Cardiologists: Second Highest Paid Physicians

A new compensation reports shows that cardiologists are the second-highest-paid physicians earning approximately $410,000 annually. However, fewer than half of them believe they are paid fairly. Orthopaedics ranked the highest in pay, making an average of $443,000 annually. Also, male cardiologists earned $81,000 more than female cardiologists but this gender inequality was found among physicians overall. See more at **https://iii.hm/3b1**

Telemedicine Trial: New Scanning Technology Benefits Diabetic Eye Care

In a national clinical trial led by Joslin Diabetes Centre's Beetham Eye Institute, ultrawide field (UWF) scanning technology significantly improved the ability of experts at a remote central location to identify diabetic retinopathy in a patient, and to assess further care. With UWF, doctors can see 82 percent of the retina. See more at **https://iii.hm/3b4**

PORTABLE US FOR HEART FAILURE

ULTRASOUND EXAM CHANGED TREATMENT IN 30 OF 119 CASES

Cardiac nurses in Norway trained in the use of handheld pocket ultrasound devices have improved diuretic dosing in patients by calculating fluid retention both in the pleural cavities (between the two membranes surrounding the lungs) and the inferior vena cava of heart failure patients.

By detecting harmful fluid retention in patients early, this could prevent their heart failure from getting worse, according to a study conducted by researchers at Levanger Hospital and the Norwegian University of Science and Technology (NTNU).

Guri Holmen Gundersen, an academic and research nurse and the first author of the study, said that a relatively high proportion of patients who came in for monitoring at the heart failure clinic had pleural effusion, also known as "water in the lungs."

The study also found that the ultrasound examination significantly predicted diuretic dosing compared to other routine examinations and blood tests.

Based on the surveys of 62 patients who visited the heart failure outpatient clinic at Levanger Hospital on a total of 119 occasions, two specialised nurses examined them each time, one using a pocket ultrasound and one not using the device at all.

When each nurse and cardiologist team discussed adjustments to the patient's treatment plan following the exam, in the case of 89 of the paired consultations, the two teams (with and without ultrasound) agreed regarding diuretic dosing and changed the treatment in 30 of 119 cases.

Gundersen said that using a pocket ultrasound device enabled early detection of signs of dehydration or worsening heart failure, before the patient experiences symptoms of breathlessness, weight gain and oedema.

The study found pleural effusion in 42 percent of the patients, suggesting this was common in heart failure.

Researchers see promise in these study findings, but stress that it remains to be seen whether the effects of adjusting the medication dosage will have clinical significance for patient progress over the longer term.

Using the handheld ultrasounds to measure the volume of fluid retention was the single factor with the greatest impact on the dosage amounts prescribed for patients and on any dosage changes in follow-up visits.

More aggressive treatment of new fluid retention occurrences can restore fluid balance and potentially improve the prognosis of patients. ■

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LEADERSHIP AND MANAGEMENT IN CARDIOVASCULAR MEDICINE

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During the last fifty years, cardiovascular medicine has remarkably advanced by continuously contributing both in the prevention of cardiovascular diseases and their diagnostic and therapeutic management.

Given the increase in the quality of life and survival rate of cardiovascular patients, it has been recognised that to a significant degree, the expectations of financial investments reflecting tax payers and healthcare managers have been met.

However, recent developments, such as the ageing population, the growing demand of patients to optimise their quality of care, but mostly the increasing cost of new medical technologies, have ranked the provision of professional services as a top priority. Likewise, the relation between cost-effectiveness as the main doctrine of healthcare systems, which requests from outstanding specialists – mostly health economists – to produce tailored financial models for the burden of cost and effectiveness in cardiovascular diseases, but also make use of digital technologies, may leave minor space for non-transparency, amateurism and any form of mismanagement.

In view of these rapid developments, physicians and several specialists in cardiovascular medicine encounter lack of knowledge and skills, while they are being directly exposed to the invasive censorship of professional healthcare managers. Even more, they tend to become victims of their Hippocratic perception when they tackle health policy challenges which are mostly driven by the tactics of minimum cost. Nonetheless, medicine and healthcare is not just any business.

Facing this reality, leading physicians, nowadays, need to deepen their knowledge, understanding and capabilities, far beyond those of any gifted amateur. The complexity of healthcare requires a sophisticated knowledge which associates medicine with professional administration, notions of health economics and global understanding against modern developments, more generally, but also, specifically, in the significant area of digital health.

The European Society of Cardiology and its bureau in Brussels, the European Heart Agency, has clearly indicated during the past three years, the urgent need to engage in key evolving areas such as health economics, quality of care and clinical outcomes, as well as professionalism of leadership.

This Leadership and Management in Cardiovascular Medicine conference in Vienna on June 16-18, brought together a multidisciplinary faculty of senior cardiologists, health economists, academics in the area of leadership and administration, as well as senior executives from industry. It consisted of a three-day forum aimed at deploying topics in cardiovascular medicine, in a way that they can be tackled based on experience and knowledge.

The utility and added value of this forum for leading physicians, but also for junior executives who aspire to pursue an outstanding career in leading cardiovascular departments, clinics and hospitals, is clear and prominent.

During the course of this forum, all participants had the opportunity to follow talented keynote senior speakers who ran an in-depth analysis of a series of topics related to these new evolving realities in the area of health economics, talent management, ethics and regulations, but also medical technologies. The latter include 3D organ printing, big data and predictive analytics in medicine. In addition, all participants were entitled to participate in interesting workshops where senior speakers triggered and promoted interaction and direct tailored discussions.

> “MEDICINE AND HEALTHCARE IS NOT JUST ANY BUSINESS”

I sincerely trust that this forum calls upon a well promising area which so far was not part of any traditional clinical seminar or congresses attended by physicians. As a result, its success will enable our society to host in the future similar recurrent events so as physicians and cardiovascular specialists will not lose momentum and will remain up to date, in view of all these fast evolving realities which play a crucial role in their profession.

I wish well that our expectations to deliver an innovative and exceptional forum will have been met and the number of participants will ensure the upcoming need to be adequately educated and enlightened in cutting edge topics far from their traditional routine duties. ■

Key Points

- ✓ Ageing population, quality of care, cost of new technologies require professional services.
- ✓ Physicians and specialists face invasive censorship from professional healthcare managers.
- ✓ New evolving realities include health economics, talent management, ethics and regulations.

ULTRASOUND GUIDES THE WAY IN STUTTGART

CLEARLY SEE WHAT TO EXPECT DURING AN OPERATION

Dr Konstantin Feise, a dermatologist and phlebologist working in aesthetic medicine, provides sclerotherapy, catheter-based laser surgery and diagnostic investigations on venous systems, for patients in and around Stuttgart, Germany. He uses point-of-care ultrasound to help get a firm picture of his patients' requirements and anatomy before surgery, and to guide procedures.

The Beginning

I first started to use ultrasound when I scanned and examined over 250 patients for a doctoral thesis in venous diseases which I undertook in Heidelberg in 2002. After that, I used ultrasound daily in normal clinical practice in a hospital in Stuttgart, and then again in an aesthetic clinic in Darmstadt. This is when I first started to perform catheter-based procedures, using both radiofrequency and laser ablation therapies, both guided by ultrasound, as well as echosclerotherapy.

Ultrasound forms an essential part of my practice. I simply never carry out any phlebology treatment without performing my own ultrasound examination first. Sometimes, referrals come from dermatologists or other clinicians who have already done some investigative work.

However, I always insist on looking for myself, to establish the correct therapy for each patient, and thoroughly map their venous system in the first instance. Equally, when it comes to the therapy itself, I need to have a clear ultrasound view of the area being treated. I always use ultrasound, for example, to guide the ELVeS Radial™ laser therapy [biolitec®] or Closure Fast™ radiofrequency [Covidien] systems I frequently use for venous insufficiency. Whatever procedure I'm carrying out – whether I'm puncturing a vein with a needle, or moving a catheter forward in the saphenous veins – I need to be sure that everything is in the right place.

> *"IT IS VERY HELPFUL TO SEE CLEARLY WHETHER LIPOMAS ARE GROWING IN OR ABOVE MUSCLE TISSUE BEFORE EXCISING THEM"*

Point-of-care Ultrasound

Point-of-care ultrasound is used for a number of procedures at the Sophienklinik, a well-established aesthetic clinic in the heart of Stuttgart where I am an attending specialist. It is sometimes quite useful to be able to have a look at the fat tissue you are about to remove prior to liposuctions of lipoedemas. Similarly, it is very helpful to see clearly whether lipomas are growing in or above muscle tissue before excising them. In both situations, ultrasound helps us to clearly see what to expect during the operation. Other times, it acts as a guide, for example, for puncturing seromas that may have formed following breast surgery.

In Darmstadt, I used a SonoSite MicroMaxx® ultrasound system and decided to stay with a SonoSite system when I started my own private practice in Stuttgart. I did have a look at other point-of-care instruments that were available, but I was more than happy with what I had used before and there was no reason to change.

Conclusion

I find the SonoSite M-Turbo® easy to use, with not too many buttons and a small menu with quite nice settings. The image quality is really good, it has a fast boot-up time and is reasonably priced. It is also very handy to carry around and robust, which is ideal when I use it both in examining rooms and in the operating theatres. ■

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DISCLOSURE:

"Point of View" articles are part of the HealthManagement.org Corporate Engagement Programme

LEADING AND LIVING IN THE REAL WORLD

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Leadership is a generic term, so when we talk about leaders in the NHS we need to be clear about who and what we are talking about and to avoid making absolute distinctions between leaders and managers.

How should current and future leaders equip themselves to meet the burgeoning challenges facing the NHS?

Accomplished leaders undoubtedly need to have a vision but any view of the future needs to be grounded in detailed understanding of the basics, which is a key management competency. I would strongly suspect any leader who said details were unimportant to them. Having a vision is not enough. It has to be to built on a strong foundation, with an understanding and clarity about the challenges, difficulties and opportunities presented in providing healthcare in the here and now. The rest is determined by the political system.

There is a belief in some quarters that the way forward is to bring in bright, motivated and successful people from outside the NHS. While very occasionally this might benefit the service, generally exogamy is misguided (Rose 2015). The raw vision which comes from within brings the best results.

A lack of willingness on the part of current leaders to speak out on issues that really matter, presumably feeling that to do so would be disloyal in some way, is a real problem. Why, for example, is no-one pointing out the tremendous healthcare pressures that were experienced by services this past winter? Or questioning why the government has stopped publishing key statistics which highlight the problems?

The silence of managers on the junior doctors' dispute has also been deafening — this despite a IHM survey revealing that six in 10 healthcare managers (58 percent) backed the strike action taken by junior NHS doctors, with more than four in 10 (43 percent) saying they '"strongly" supported it (Cramer 2015). Only a third (33 percent) said they opposed the action yet the voices of the majority were notable by their absence. The emperor has no clothes. Who ever will tell him?

The rhetoric from the government should be challenged. It is NHS managers on whom the service depends and without the space, scope and encouragement to challenge the status quo and articulate their vision it is far harder for them to flourish and grow.

Dilemmas and Disquiet

It is no secret that there is a lot of disquiet about where the NHS (Commons Select Committee 2015) is going and how much of the Five Year Forward View - which contains some very good ideas — can be delivered when there is not enough money in the system. This creates a dilemma. What can NHS leaders do about it?

The answer is that they have to be realistic about what can and cannot be achieved. A vision cannot be built on sand but once it has been clarified, agreed upon by the Board and teams across the organisation, I'd urge leaders never to give up on it. Listen downwards - the best way to incrementally alter the NHS is through bottom-up leadership. Look to influence part of a slightly wider world. Arm yourself with a clear, up-to-date sense of the pressures and challenges that the organisation faces and make a distinction between the scope there is for addressing them and 'pie in the sky' solutions.

It must also be remembered that the NHS is sometimes one organisation and sometimes a hundred, so another challenge for leaders is to attune their antennae to all the signs and signals around decisions that are being taken nationally and what those on the ground are understanding and advising locally.

In the current tight financial climate, those leading NHS organisations have a number of options: Limit what they do,

> "LISTEN DOWNWARDS - THE BEST WAY TO INCREMENTALLY ALTER THE NHS IS THROUGH BOTTOM-UP LEADERSHIP"

do it less well, or find more efficient ways of doing it. The answer may well be a combination of all three, but it is vital that they don't focus on one at the expense of another. They need to be separated out. Each will have its appeal, consequences and limitations and these need to be thoroughly examined and understood.

Practical Solutions

It is essential that leaders do not spend all their energy on spectacular solutions but on those inescapable facts they have to address and fix. Again, if an aspirational solution is being proposed as the way forward, they must look closely at its intended and potential consequences. Understand, criticise, self-criticise, calibrate the risk. By all means take a carefully considered risk — but always safeguard the basics.

And then there is the question of how a good leader responds to change. While all plans must obviously have a high degree of robustness, I share the sentiments of the economist John Maynard Keynes who, apparently, when faced with his detractors, was paraphrased as saying: "When facts change, I change my mind. What do you do?"

The strength and capability of the NHS is enormous and we are rightly proud of it. The service is also a highly transparent organisation, constantly in the glare of the public eye, whom we often hugely underestimate in terms of what they know and how they cope with real situations. Ownership is part of their right. Leaders must remember that we are all in this together. ■

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IS YOUR LEADERSHIP STYLE ONE SIZE FITS NONE?

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What if you walked into your favourite coffee shop one day and discovered that you couldn't order your usual "customised" coffee? You'd be served caffeinated black coffee or nothing at all. Many industry leaders recognise that their customers are demanding customised experiences; after all, you can customise everything from your computer to your morning cup of coffee. But what about the frontline employees providing these customised experiences? Should their leaders expect them to perform their work in a "black coffee" world, with each employee being treated exactly like the one next to him? In our increasingly customised world, it should be no surprise that employees might expect customised approaches from their leaders. A one-size-fits-all approach doesn't work any better in leadership than it does with serving coffee to a Starbucks generation.

As a leader, the payoff to customising your style to each employee is a more motivated and engaged workforce. "But," you're thinking, "creating an individual approach to each employee is time consuming! Where is this supposed to fit into my schedule?"

Start With the Constant

While working to customise your approach to employees' styles, there should always be one constant in the equation. The organisation's expectations and standards should be clear and unwavering to everyone. All employees should be working toward the same clearly communicated goals.

Those standards and goals should also be built into job descriptions, new employee orientation and regular evaluations. At all stages of their employment, employees will reconnect with these standards and be held accountable to them.

Using Different Gifts to Achieve the Same Goal

Once all employees know they are headed in the same direction toward the same goal, it's time to get personal and discover what gifts each of them bring to the journey. Some employees are natural "people" people—they are always there with a warm greeting and an encouraging word. Some are sticklers for detail who won't let a process deviate off-track, and some are innovators who come up with creative new ways to achieve your goals.

All of these gifts can be useful in living up to the organisation's standards; it's up to the leader to pay attention to each employee's gifts and help them to use those gifts to the greatest benefit.

What Makes Them Tick?

In order to truly motivate employees, you have to understand what's most important to them and what inspires them to go above and beyond. Successful leaders know that engaging and retaining talented employees takes more than just assigning tasks and monitoring their completion.

What motivates you may not be the same for your employees. It's important to find out what causes your employees to join the organisation and what keeps them present and engaged. Some leaders sit down with their employees for periodic "check-ins" to find out what motivates them. Others ask via employee surveys. One key to employee motivation and engagement is to ask, not assume. For instance, if you know that an employee feels most connected and productive if he feels free to approach you with questions, then make sure you let that person know when and how to contact you with questions.

Another key to employee engagement is to see it as a process. People change over time, and with changes in circumstances come changes in motivation or attitude toward work.

Keeping Them on Track

Just as you can observe distinct strengths in each of your employees, you can also observe where they're likely to get off track. The "people person" mentioned earlier is great with greeting customers and making them feel welcome. However, a couple extra minutes spent enthusiastically commenting on the customer's new outfit may mean that a phone is left ringing too long or another customer is kept waiting a few extra minutes. Leading this type of person requires gently coaching them to use their gifts but to stay on task. It's important to help the employee see that you appreciate her gifts, yet offer guidance to keep things on track. On the flip side, you may have someone who is a stickler for efficiency who wants to move on to the next call as efficiently as possible. The outcome is that she seems abrupt. In this case, you want to recognise her for her efficiency and encourage her to slow down enough to interject warmth and concern into the conversation.

Successful leaders know that treating each employee as an important individual is worth the time and investment. Those leaders who take the time to observe, develop, and reward their employees' natural gifts are rewarded themselves with a group of employees who are committed to helping the organisation live its mission, vision, values, and brand promise. ■

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THE AFFIDEA MR EXCELLENCE PROGRAMME

UNIFICATION, OPTIMISATION AND ANALYTICS FOR SERVICE IMPROVEMENT

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The Problem With MRI

Magnetic Resonance Imaging (MRI) is not only one of the most complex parts of the diagnostic chain, it is also one of the most expensive. Obtaining excellent anatomical and functional images is time consuming and requires high levels of technical expertise. Although vendors are attempting to codify workflows, there are numerous factors that lead to increasing heterogeneity in the way images are produced and the time it takes to produce them *(table 1)*. The Affidea MR Excellence programme was developed to address these issues.

The Affidea MR Excellence Programme

An international working group was formed, comprising six clinical radiologists led by an MR Biomedical Engineer with 25 years of experience on MRI protocol optimisation. By consensus, standardised protocols were developed in eight workshops. For each indication and body part it was decided which sequences should be divided into which protocol, dividing them into four categories: i) core sequences, ii) recommended sequences, iii) conditional sequences, and iv) optional sequences. The optimisation part was conducted by a combination of site visits of the MR Applications Consultants and remote access to a Protocol Exchange Platform that was developed to easily transfer optimised protocols to those sites where no site visit was performed. In addition, a Moodle based educational site, the "MRI Academy", was developed in order to provide access to 12 MRI courses.

Metrics

The Affidea Imaging Metrics (AIM) platform was developed as a web-based system to collect, process, quantify and present metrics retrieved from local 'agents' on an interactive dashboard. These agents transmit anonymised metadata derived from the DICOM headers through secure FTP to a central server. These data are compared with a reference database and compliance to standardised protocols calculated. In addition, deviation is defined as the percentage of sequences not included in the standardised protocols. Other key performance indicators include: number of exams, voxel size, examination time, and waste time *(figure 1)*. After a period of monitoring, local teams assess workflows to reduce waste time, using lean methodology and the AIM platform to assess impact *(figure 2)*. The user can setup his/her own alerts and when a specific KPI threshold (set by the user) is violated, an automatic e-mail is sent to the recipients that the user has defined.

Factors negatively influencing MR comparability

- Rapid technological development
- Vendor-specific sequence development
- Lack of unified guidelines regarding which sequences are used for any given indication
- Variable on-system image quality optimisation
- Institution-specific patient pathways through the MR department
- No defined key performance indicators to allow meaningful benchmarking

Results So Far

The process of protocol unification has been ongoing for 14 months. So far, 74 standardised protocols have been developed, applied in five European countries at 33 MRI sites. More than 1,500 pulse sequences have been included in the standardised protocols and optimised in eight MRI systems from three different MRI vendors by a group of four MR Applications Consultants. Agents have been installed in 14 MRI departments in three European countries. The KPIs of 18 MRI scanners are currently being monitored in real time. Reduced protocol time has resulted in extra imaging capacity in all three countries, with improvement of objectively measured image quality.

Overcoming the Challenges

The imaging 'market' is fragmented. A handful of vendors are attempting to improve the clinical delivery of imaging services, but this is contingent upon independent institutions, separate from, and in some cases in competition with, their neighbours.

We have successfully implemented a programme across five countries; the project's success so far has been based on the recruitment of experts in the process of unifying and optimising the examination protocols across a range of systems and vendors, development of a fit-for-purpose analytics tool, the appetite and skill set to take on the challenge, and the scale of network in which to operate.

The driving force was the highly motivated stakeholders who realised the benefits and merits of such a project in their daily routine and the impact on the diagnostic services provided. Although a challenging process, protocol unification

Figure 1. The AIM dashboard provides real time information regarding 7 KPIs including: Number of exams, Examination Time, Waste Time, Compliance, Deviation, Image Resolution and Performance Index. There are mini 7 mini tablets providing the average values of each KPI and the relative percentile change comparing to the previous month; the font is green in the event of improvement and red in the opposite case. In addition, there are 7 charts presenting each KPI value for the different countries.

Figure 2. Comparative charts for each KPI can be generated on the fly, using: country, site, MRI model, Radiographer, Examination Type, Site Class and Technology Band as filters. In addition, the user can define two time periods for the comparison. Two dashed horizontal lines corresponding to the Average and 5% (or 95% depending on the KPI) Global Affidea value are shown.

DISCLOSURE:

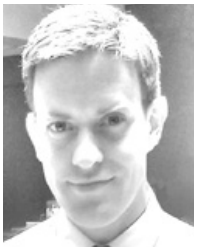
"Point of View" articles are part of the HealthManagement.org Corporate Engagement Programme

is necessary to achieve workflow optimisation and therefore improve the quality of service. Although 'standardisation' is often considered a dirty word in an era of personalised medicine, the MRI Excellence programme has been constructed in a manner to allow flexibility around clinical indications and technological specifications. A fine balance has been achieved between clinical autonomy and the ability to benchmark effectively.

Conclusion

The Affidea Imaging Metrics Platform has been essential in providing important data regarding the image quality of the conducted exams, the examination time and the amount of variance between studies. However, it is only through coupling this with lean methodology, dedicated implementation teams and and with committed clinician engagement, that a holistic programme has been implemented. ■

HOW DESIGN CAN IMPROVE THE HEALTHCARE EXPERIENCE



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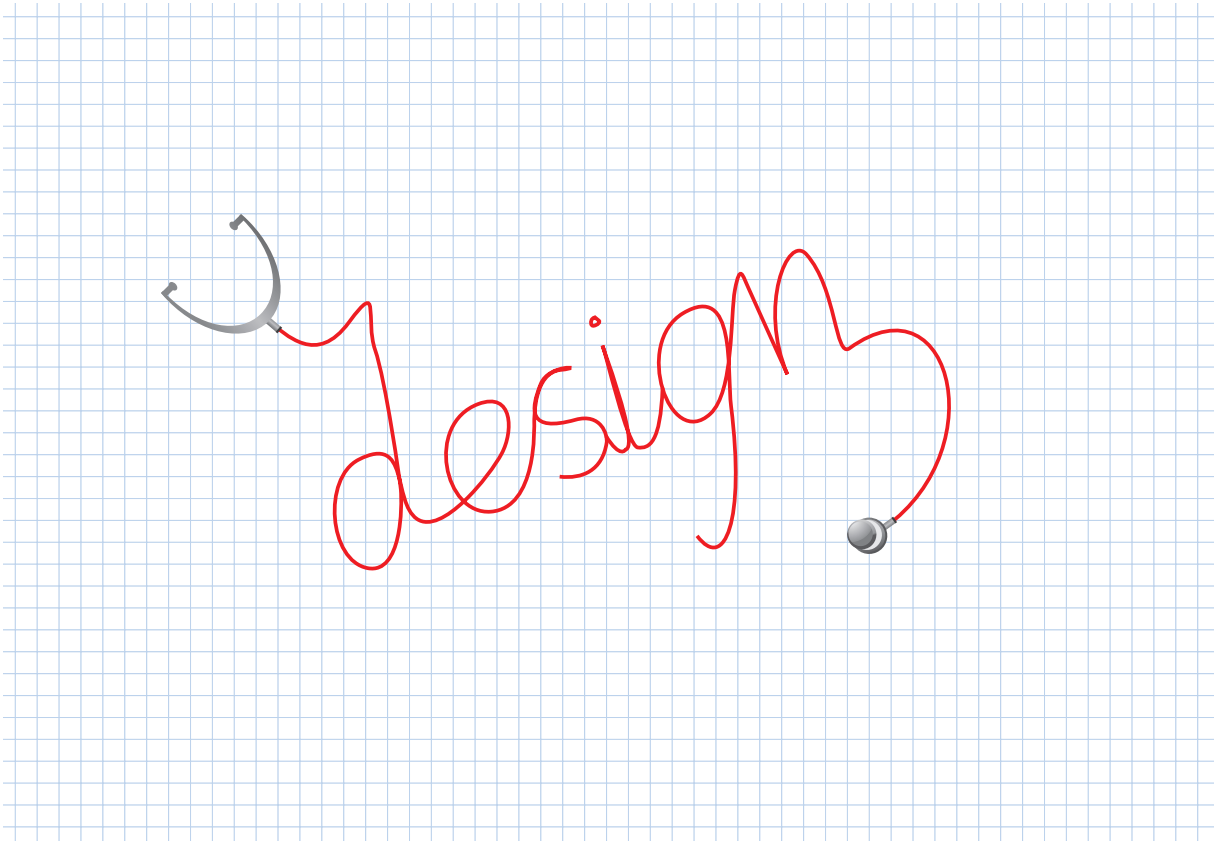

Design Council's founding purpose was to elevate the UK's industrial design standards in goods manufacturing to support Britain's economic recovery. Now, after 70 years, much of what we do is centred on how design can help to improve the health and wellbeing of people in the UK and the wider world.

Over the last seven decades, Design Council has made a significant and tangible contribution to solving some of the UK's most complex challenges by providing design support and the advice, tools and know-how to bring about positive change.

The impact of design is now widely recognised, with Chief Design Officers a common role in businesses worldwide. In 2014 we saw the proposal to appoint a Head of Design in every UK government department and a Chief User Officer on all large government infrastructure projects (All-Party Design and Innovation Group, 2013).

The use of strategic design is becoming intrinsically linked with good foresight and managerial skills. One of Design Council's finest examples of how design positively affects management thinking in healthcare is its work on reducing violence and aggressive behaviour in A&E.

The Problem of Violence

Violence and aggression towards frontline hospital staff is estimated to cost the NHS at least £69 million a year (NAO 2003) in staff absence, loss of productivity and additional security. As many as 68,000 physical assaults occur in English NHS hospitals each year (NICE 2015), a figure which continues to rise.

With more than 21 million patients attending A&E (House of Commons Library, 2015) each year, increasing pressure on A&E departments can lead to negative experiences for both patients and staff. In the complex, high-pressure environment of A&E, escalating frustrations can be particularly difficult to manage and diffuse.

The Reducing Violence and Aggression in A&E: Through a Better Experience programme was undertaken by a triumvirate of Design Council, PearsonLloyd and the NHS, and sought to address non-physical aggression and hostility towards staff by improving the A&E experience.

Extensive ethnographic research was conducted at three NHS Trusts. Patient journeys through A&E were mapped alongside incidents of violence and aggression. Insights were gathered to understand why patients might become aggressive and what types of patients might be more prone to becoming aggressive. In response to the research findings, the team developed three solutions to improve the experience of both patients and staff, reducing anxiety and promoting a positive hospital culture:

- The Guidance Solution: a comprehensive package of information about the department, waiting times and treatment processes via on-site environmental signage, patient leaflets, and digital platforms;
- The People Solution: a programme of reflective practice designed to better support NHS frontline staff to manage and learn from incidents of violence and aggression;
- The A&E Toolkit: a package of information and guidance for NHS managers, clinicians, designers and healthcare planners who want to develop and deliver a better service in effective and inspiring environments.

Crucially, these design solutions were co-designed, installed and evaluated within working A&E departments. By doing so, the programme directly bridged the gap between policy-thinking about how to manage staff safety on the frontline, and delivery against that policy objective through the application of design and behavioural science to create effective solutions.

The Guidance and People solutions were installed and piloted at two A&E departments: Southampton General Hospital and St George's Hospital, London. A comprehensive evaluation was carried out by Frontier Economics and independent research company ESRO to test their impact. It found that 75 percent of patients said the improved signage reduced their frustration during waiting times, and threatening body language and aggressive behaviour fell by 50 percent post-implementation. Most tellingly, it discovered that for every £1 spent on the design solutions, £3 was generated in benefits.

Co-design

Another tangible example of how design has benefited healthcare can be found at the Whittington Hospital in Archway, north London. The Whittington is one of the UK's busiest hospitals, employing 4,000 staff who provide care for more than 500,000 people across north London.

During 2013-14, the hospital collaborated with designers, architects and their own patients to discover how best to use space and redefine the user experience of its pharmacy.

Chief Pharmacist, Dr Helen Taylor, knew that collecting a prescription was not a pleasant experience for her patients. They entered the pharmacy often feeling unwell and anxious; feelings only exacerbated by long waiting times and lack of communication. Previous efforts to improve the situation, such as user questionnaires, had resulted in poor levels of patient participation and yielded no clear insights. However, Dr Taylor felt sure the answer lay with design, and turned to Design Council to see how we could support the service delivery.

Over a year, two of Design Council's expert Design Associates, Anna White and Sean Miller worked closely with the Whittington pharmacy to analyse the service and pinpoint areas where improvements could be made. Eventually a shared definition of the problem was agreed, and the team identified three key actions to address: improve the experience for patients, use every intervention as a health promotion opportunity and develop a retail offer to offset expenditure.

> ***"WE BELIEVE THAT GOOD DESIGN BEGINS WITH HAVING THE END USER IN MIND"***

Using the findings, the team turned these priorities into a detailed design brief. Design Council then helped the Whittington pick two design agencies to work with: architectural co-design experts *Studio TILT*, and service design agency *Commonground*.

The co-design approach meant the designers' focus was on allowing pharmacy users to collaboratively create a space which would work best for them. Patients provided real-time feedback and responses as they interacted with the new prototype elements in the pharmacy.

The project has measurably improved the patient experience at the Whittington, boosted staff morale and increased sales at the pharmacy. Importantly for the hospital, it has also produced a design model that can be applied to other spaces within its walls, and a willingness to experiment.

Having an internal champion who really understood the process, in this case Dr Helen Taylor, was central to the success of the project. Hospitals are naturally risk-averse environments. However Dr Taylor's ability to navigate internal hospital politics and convince staff to engage with the codesign process gave the project credibility and the space to thrive.

The success of the pharmacy project had shown management at the Whittington that the design process could help improve the experience and efficiency of hospital services for both patients and staff. Management subsequently invited *Studio TILT* back to work on a further project using the same co-design process to help create a major new Ambulatory

Care Centre, this time with architects *Levitt Bernstein*.

After exhaustive prototyping using full-scale mock ups of the new space, *Levitt Bernstein* then helped realise the innovative designs and ensure technical standards were met.

Layout That Works

The centrally located phlebotomy booth combines so much of what is successful about the new centre. While private when necessary, it is positioned directly in the communal space demonstrating the centre's challenge to clinical traditions of keeping treatments, waiting and administration separate. The space quite literally demonstrates the integrated care model.

> ***"THE PROJECT HAS MEASURABLY IMPROVED THE PATIENT EXPERIENCE AT THE WHITTINGTON, BOOSTED STAFF MORALE AND INCREASED SALES AT THE PHARMACY"***

The flow of the centre is shaped as a 'figure eight', which passes all cubicles and treatment rooms allowing infection control and easy mobility for staff and patients. Many areas have been created as multifunctional, including the children's play area, which doubles as a designated observation area. Children can be treated with ease without even being aware.

On opening the new ACU, Minister of State for Care and Support, Norman Lamb commented on the design approach to the new centre: "I confirm I have seen the future of healthcare in the UK. This new centre is a fantastic experience for the patients by fusing together the skills in the community with this exceptional centre of excellence. Patients here are very enthusiastic about their experience and appreciate how different it is to a busy A&E department" (Design Curial, 2015).

Dr Taylor attested to the legacy of working with Design Council and learning about the power and value of co-design: "As we get funding for different bits, we implement them. The hospital's management team feels strongly that we should just push work like this through because it has such a good effect on patients." That, in a nutshell, is what Design Council's work is all about. We believe that good design begins with having the end user in mind. Good public services are no different. That's why effective, efficient and above all sustainable public services have design at their heart. So transforming these services has to begin with people. ■

Key Points

- ✓ The pressures on A&E departments can lead to negative experiences for both patients and staff. Patients, who are already feeling vulnerable, can become frustrated and hostilities can easily arise. With A&E staff bearing the brunt of these tensions, wellbeing in A&E departments can be particularly low.
- ✓ In this context, Design Council, in collaboration with the Department of Health, looked at how design can alleviate tensions in A&E departments, with the objective of improving both patient and staff experience and thereby reducing triggers of violence and aggression.
- ✓ Design can improve health outcomes for patients, young and old and can prevent many common ailments. It can also improve their experience as a whole.
- ✓ A better-designed experience can reduce violence and aggression in high-pressure environments such as A&E.
- ✓ Design can help improve the effectiveness and efficiency of public services, as well as save funds and improve sustainability.

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THE CREATIVE PROMISE OF DESIGN THINKING

You're much more imaginative than you think, but your workplace — which needs your very best ideas — may be driving the creativity right out of you.

Big businesses can be the worst offenders, demanding a level of predictability and efficiency that is good for today's bottom line but bad for tomorrow's. The pressure to grow is relentless, but the battle is often uninspired.

I teach a different way of thinking that can spur inspiration and innovation even in the most traditional of workplaces. It's called design thinking, and it's simply a different approach to problem solving. Design thinking nurtures creativity, which is not as random as you think.

Design thinking dispels the "Moses Myth" — the belief that only a special person can part the seas and create. Design thinking arms even the most traditional thinker with ways to creatively blossom. Those arms include tools varying from visualisation — the use of imagery to see possible future conditions — to journey mapping, which is assessing things through the eyes of a customer.

My book *Solving Problems With Design Thinking: 10 Stories of What Works* includes details on the use of these tools. The field guide companion to the book — titled *Designing for Growth: A Design Thinking Tool Kit for Managers* — takes you step by step through the design thinking process.

Design thinking offers an alternate path. That alternate path leads to more creative solutions, often simple but game-changing ideas, such as suitcases with wheels and easy-to-pour, upside-down ketchup bottles.

Most managers are taught a linear problem-solving methodology: define the problem, identify various solutions, analyse each and choose the best one. Designers aren't nearly so impatient — or optimistic. They understand that successful invention takes experimentation and that empathy is hard-won.

Embracing design thinking means understanding that the customer is a real person with real problems, rather than a sales target. Instead of traditional market-research data, design thinkers dig for data that are user-driven and offer a deep understanding of a customer's unarticulated needs. Design thinking helps reframe questions in a way that expands the boundaries of the search itself.

Unearthing unarticulated needs must be done before solutions are even contemplated. Or as Steve Jobs famously put it: "*It's really hard to design products by focus groups. A lot of times, people don't know what they want until you show it to them.*"

Design thinking requires taking a hard look at the present and drilling down to the essence of an issue to see what really matters. Researchers at Procter & Gamble were focused on improving detergents used to clean floors. That focus was limiting. Design thinking pointed them to a better answer — a better mop. So was born the best-selling Swiffer.

One of the keys to conjuring up a product like the Swiffer is brainstorming, though not the traditional kind. I call it structured brainstorming, which uses the data collected during the discovery phase as input, then converts the brainstorming output into something valuable — concepts of new possibilities. The kind of structured brainstorming approaches that designers use are far more productive than the free-form shout-out that we've all endured in the past. The ideas can be so plentiful that one firm I recently worked with generated more than 300, which they narrowed down to 23. Of these, only five eventually made it to marketplace testing.

Design thinking works to make marketplace testing practical by engaging customers in the act of building a new product. You need to create as vivid an experience as possible. You're engaging the customer to get at their needs. It's not a dress rehearsal.

In our own work at the Darden School of Business, we've seen firsthand how the design thinking approach has helped healthcare clinicians and staff open minds and find new solutions to long standing healthcare delivery challenges. Through projects as diverse as extended patient stays, hand hygiene and service delivery for patients seeking mental health services, the design thinking process clarified the need for new ways of thinking that began with a better understanding of the individuals involved.

Unlike traditional marketplace thinking, design thinking expects to get it wrong. You experiment and figure out why it works or not. The goal is to fail early to succeed sooner. Actively look for data that proves the product won't work. It's valuable information for saving money and zeroing in on how to make products that do work. ■

Thanks to Darden School of Business, University of Virginia for permission to reproduce this piece.

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Biography

Professor Jeanne M. Liedtka teaches Business Administration at the Darden School of the University of Virginia. Liedtka is an expert on the hot topic of design thinking and how it can be used to fuel innovation and organic growth.

Liedtka's most recent books are *The Catalyst: How You Can Lead Extraordinary Growth, Designing for Growth: A Design Thinking Tool Kit for Managers, The Physics of Business Growth* and *Solving Business Problems With Design: 10 Stories of What Works.*

Quality. Functionality. Style.

Nowadays, both in the private and public building sector, architects and construction companies are confronted with sophisticated demands of their clients. Individual solutions are commonplace when it comes to aspects of architecture and interior design.

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SUSTAINABILITY IN HOSPITAL DESIGN

AWARD-WINNING ZULEKHA HOSPITALS OFFERS INSIGHTS INTO SUCCESSFUL PROJECT MANAGEMENT

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One of the crucial elements in ensuring building sustainability is a fully developed Operation and Maintenance (O&M) plan. It comprises a set of planned activities that encompass not only technical aspects but also managerial, social, financial and institutional issues. All of them must be directed towards the elimination or reduction of major constraints that prevent the achievement of sustainability.

Very often, buildings fail to comply with basic sustainability standards due to poor planning, inadequate resources including the lack of a highly skilled and trained technical team, specific test equipment and tools deficiency or the absence of an after-sales service support from suppliers.

O&M processes are often neglected or discussed and introduced only after the project is completed. This usually affects the credibility of the investments made and the functioning of the services provided. To minimise losses, an O&M plan should be formulated during the design stage itself, so that each project phase embraces the O&M guidelines and ensures the building becomes sustainable.

O&M takes into account all of the activities needed to run Building Engineering Services to ensure efficiency, effectiveness and sustainability of facilities. While Operation refers to the direct access to the system by its users and governs their access, Maintenance focuses on the technical activities, planned or reactive, which are needed to keep Building Engineering Services systems working efficiently. This is why the entire O&M process requires specially-trained staff and appropriate procedures in place to carry out substantial auditing and to ensure a viable life cycle of the process.

Challenges

The Main Challenges the O&M Plan Brings Are as Follows:

- Implementing the O&M plan in the project concept during the design stage;
- Project execution and commissioning plan should incorporate O&M plan;
- Project specific O&M manual should be ready upon completion of the project. The manual should serve as a core document to assess all aspects of the project and the O&M for the Building Engineering Services management team to ensure sustainability in each area of its operation.

A Requirements Checklist for O&M Includes:

- Adequacy of skilled/trained experienced O&M technical team with proper engineering workshop facility;
- Building Automation and CMMS;
- Implementation of O&M plan with specific timeframes;
- Ensuring quality power supply for all critical services, energy auditing and energy management;
- Ensure quality water supply for all critical application and water conservation management including water treatment and reuse;
- Ensure Indoor Air Quality and Exhaust Air Management including energy recovery;

- Hazardous and non-hazardous waste management procedures;
- Building Fire Safety Management including providing HSE training to all staff;
- Safety & Security Service management;
- Effective communication to all staff;
- Training of all staff: new staff orientation/departmental/mandatory training.

Maintaining sustainability is extremely challenging and it requires cooperation of a dedicated team 24 hours a day. Usually, a team has to ensure that every individual piece of equipment is functioning, keep and maintain its history to track its past breakdowns and manage preventive maintenance logs and the details of the replacement parts.

These kinds of tasks are extremely laborious, time-consuming and involve a huge amount of paperwork and record keeping, subsequently causing storage space issues. To solve this issue, our engineering team has developed a solution by incorporating Facility Management Software within the existing Building Management System. This proved to be conducive in planning, monitoring and retrieving of the information from the control room.

Another challenging issue we faced was related to inter-departmental movements of staff in the building. To address that, we developed a pneumatic tube system allowing for the transport of samples, blood, body fluids and MR files, for example, between departments with an air-cushioned vacuum support. This automated approach was a milestone that helped us to streamline the system and achieve higher efficiency and effectiveness with much lower manpower and waste of paper.

Supporting Sustainability

We are focusing on three different perspectives: energy management, water conservation, and indoor environment management. Making a building energy-efficient and sustainable requires the provision of automation applicable to the building management system, lighting control system, chiller plant manager, and ensuring the design maximises daylight exposure while being heat resistant.

To ensure efficient energy management, we designed a sub-meeting facility for all major energy flows as well as a water supply facility to maintain its quality for different applications and to optimise its reuse.

Indoor Air Quality is a major concern in all air-conditioned buildings and its design should ensure proper air barriers, dirty air exhaust and +ve and –ve pressure maintenance to avoid air contamination. It is also essential to ensure adequate fresh air level by having an adequate number of air changes with energy recovery facility.

The ultimate challenge is to maintain the indoor setting as a healing environment and to achieve it, the design of the building and its interior have to be compatible with mechanical and electrical engineering services (for example the Nurse Call system throughout the inpatient areas).

Maintaining a healing environment also requires appropriate quality air circulation while restricting the spreading of airborne diseases as per CDC/WHO norms. Last but not least, a comprehensive fire alarm system needs to be designed in such a way that all systems can be controlled and monitored from one room.

Framework for Sustainability

The Leadership in Energy and Environmental Design Standard (LEED) is the epitome of building sustainability. Our facilities in Sharjah and Dubai are aiming for LEED certifications. We are committed to and focused on being environmentally responsible and have developed resource-efficient systems addressing employee productivity, health and wellbeing, occupants' comfort, aesthetics and durability through efficient resource management and waste reduction. This commitment is reinforced through our collaboration with the design team, architects, engineers and the contractors from the initial stages of site selection through design, construction, operation, maintenance, and renovation.

Complying with LEED Standards is at the core of our ambition and currently our facility in Sharjah is undergoing the LEED EBOM certification (EBOM- Existing Building Operation and Maintenance) while both Zulekha Hospital Dubai and Alexis Hospital in India have been constructed in compliance with the LEED certification plan. Our goal plan is to receive the LEED certification for all new projects and LEED-EBOM for all existing buildings.

Budgeting Concerns

We always plan our facility management budget ahead and set up a dedicated fund for Continues Facility Improvement for introduction of new technologies, energy-efficient controls, equipment, and solutions to increase its productivity and life-cycle and ensuring minimal waste generation and appropriate staff training.

We usually dedicate 20-35 percent of the total Facility Management budget to sustainability. Even though the funds allocated for maintaining or achieving sustainability are quite high, our past experience proves that we can recover the invested amount within a prescribed timeframe.

Zulekha Hospitals Group includes two multidisciplinary hospitals in Dubai and Sharjah as well as one diagnostic centre, three UAE medical centres and three pharmacies. In March this year, it received the Best Sustainable Hospital Award at the Hospital Build & Infrastructure Awards, and the Dubai Quality Award for its commitment to quality service and business excellence. ■

Key Points

- ✓ Establish a fully developed Operation and Maintenance (O&M) plan before start of project.
- ✓ Identify challenges for sustainability at onset of works and for ongoing maintenance and address them.
- ✓ Main sustainability areas are energy management, water conservation, and indoor environment management.
- ✓ Aim for recognised sustainability certification such as LEED.
- ✓ Allocate part of budget to achieving and maintaining sustainability.

SIMULATING STRESS IN HOSPITAL WORKFLOW

COMPUTER MODEL LOOKS AT ER FUNCTIONS, EVEN BEFORE IT'S BUILT

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With the cost of building a good hospital estimated at around $1 million per bed, it makes sense to test out new layout ideas before any actual construction gets underway.

As a new hospital is an incredibly expensive endeavour, we used a software programme to test different variables in the efficient functioning of an accident and emergency department.

Types of Simulation Commonly Used in Healthcare

There are several types of simulation commonly used in healthcare: device-based, role-based and model-based. Device-based simulation would use a manikin to learn how to properly perform CPR. In role-based simulations, future nurses and physicians act out scenarios with standardised patients. Model-based simulations — like the ones I work on — are a little different in that they don't require a physical object or interaction with an actor, but instead can exist solely on a computer. However, they are extremely powerful tools for testing novelty and innovation in healthcare.

One example was when I was working on testing new ideas for the emergency department of the Nemours Children's Hospital in central Florida a few years before it opened on October 22, 2012.

On opening day, the entire team would have to function like they knew what they were doing. And hospital leadership wanted to move patients through the system in a way that had never been done before.

The goal of any hospital is to get patients through the emergency department and either discharged or admitted to the hospital as quickly as possible — a measure called "length of visit" — while still caring for each effectively. The simulation can test how factors like the number of nurses or the way physicians are allocated can change, for better or worse, this length of visit.

Instead of labeling incoming patients as those that were critical and those that were not critical, our team tested out the system of dividing them into four groups called "care streams." In addition to the critical care stream and the "fast track" stream (in a way similar to the nearby Disney World that gets certain riders through the lines quickly, this group doesn't need much care and can be treated and discharged quickly), Dr. Todd Glass, the hospital's chief of paediatric emergency medicine, devised two middle streams: therapeutic and diagnostic. These two streams are patients who do need emergency care although not urgently like the critical stream and yet more complicated care than the simple fast track stream. Therapeutic stream patients have an obvious ailment — a broken arm, for example — and can begin treatment immediately without a lot of diagnostic workup. The source of diagnostic stream patients' problem is less obvious, so testing needs to be performed before its clear how best to treat them.

We took these novel ideas and embodied them into the computer simulation programme. In doing so, we determined that we actually needed a fifth stream, a subset of the critical care stream, of resuscitation or 'code' patients.

Just taking ideas out of people's heads and putting them into a computer programme is illuminating.

Even something as seemingly simple as the size of the waiting room needed can be tested using these simulations. Because this is an emergency department for a children's hospital, one assumption would be that each patient will come with one or more adult family members, and those parents might also bring other children who will also need to be comfortable while their sibling is being treated.

> ***"JUST TAKING IDEAS OUT OF PEOPLE'S HEADS AND PUTTING THEM INTO A COMPUTER PROGRAMME IS ILLUMINATING"***

The hard work paid off when the design for the hospital won a citation in the 2011 Modern Healthcare Design Awards.

Technology of Modeling People Flow is Not New

Modeling the flow of people through the hospital is not a new idea: the technology in some form has existed since the 1970s, and the hospital emergency room has always been a classic example. However, modern technology has allowed for greater complexity in the modeling process and faster processors make it easier to input details and run multiple scenarios for "centuries" to see what percentage of the time certain events occur. I can give them centuries of experience with their emergency department before they even stick a shovel in the ground.

Essentially, what our team was able to do was feed a number of "building blocks," each of which represents some aspect of the real world, into the computer programme. The building block might be an "agent," like a nurse or a patient, who has a specific goal: tending to the patient or being treated, respectively. Those agents then interact with other building

The workflow of an emergency room modeled by a computer simulation programme

blocks, like the number of available treatment rooms, and these interactions lead to different outcomes.

It's a matter of deciding what parts of the real world you want to explicitly present. You can almost always add new details to further refine the simulation, but although modern processors are extremely powerful, the human building the model still only has a set number of hours in the day. It really comes down to a negotiation of time — how soon you need the answer and what level of detail you are willing to live with. It's a matter of who is using it to make what decisions about actual hospital design, patient care workflow or operations.

Of course, those decisions will only be as good as the assumptions put into the model in the first place. As scientists, we want to go find some record of history to make the assumptions, but you don't have to throw away this analytic approach just because you don't have historical data. An estimate is better than a wild guess. And even if there is no good estimate, the scenario can be run with several different values for that variable, which allows testing of how sensitive the ultimate outcome is to that particular feature.

Computers Also Factor in Natural Variability

Because the world really does have some degree of randomness, the computer can factor in that natural variability as well. We set up the assumptions, we turn it loose, and we sit back and see what it tells us. Because the same scenario can be run multiple times with different values for the random variables each time, these simulations can help the designers anticipate — and thus prepare for — the unusual.

Ultimately, though, it's what happens in the real world that matters.

Until we run further tests, we can't know for sure how much we can take credit for. All we know is that since opening, the emergency department at NCH has had an average length of visit that is roughly half that of the rest of the industry providing similar paediatric emergency care. ■

Key Points

- ✓ There are several types of simulation used in healthcare: device-based, role-based and model-based.
- ✓ Among many other variables, a simulation can test how the number of nurses or how the physicians are allocated can change the "length of visit".
- ✓ Four "streams" were devised to find efficiencies in the design of our workflow and resource allocation.
- ✓ Simulation becomes a means to assess alternatives without putting patients through sub-optimal experience just to learn what does or does not lead to improvements, optimal care and minimal non-value wait times.

HOSPITAL READMISSIONS AND MACHINE LEARNING

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The need to improve the efficiency of the healthcare services has emerged over recent decades and, especially, during the last few years with the economic and financial crisis, developed countries have been suffering.

The ageing population, the sector most affected by chronic diseases, is seeking better results when they need the healthcare services and, in particular, hospital services.

Hospital services account for 40 to 60 percent (OECD, 2015) of healthcare costs, even increasing to 75 to 85 percent (Centers for Medicare and Medicaid Services, 2012) in the cases of chronic diseases like CHF, COPD, mainly because of the high costs of readmissions. Co-morbidities added to the main health problem can create a more complex scenario.

Moreover, we have to consider the quality of life of the patient who suffers frequent readmissions: nobody likes to be admitted to hospital and facilities are sometimes unsafe. The inconvenience and the direct and indirect costs for patients and caregivers are huge.

Finally, from the clinical point of view, treating these cases do not give any special added value to the knowledge of clinicians attending to such patients. Normally the process is repetitive with similarities to the Taylor model of production (New England Journal of Medicine, 2016).

For all reasons, the vision of the hospital of the future is a facility that will have inpatient services, mostly for people undergoing an important surgical procedure (even in this case, the length of stay of most of the procedures has decreased dramatically). As far as other reasons for occupying a hospital bed are concerned, we can refer to emergency services for critically-ill patients suffering a non-preventable, life-threatening episode. Finally, some complex diagnostic procedures - most of them linked to radio diagnostics - may require a reduced stay at the hospital.

Variables

The main pressure on reducing the readmission rates has come from the payers and financing bodies of the healthcare systems, public or private, of which perhaps the most known are Medicare and Medicaid, established by CMS from 2014 for US hospitals.

The model has been followed as an example in many health systems across the world. This is the case of Catsalut, the public Catalan Health Care payer, where if a patient is readmitted for the same reason during the next month, the hospital only receives 0.4 percent of the established fee. Furthermore, through reducing readmissions a hospital can attend to more patients, increasing the productivity from the population management point of view.

The question is: how can we reduce our readmissions? If we explore the literature, mostly published in the last five years, we cannot find a simple explanation and we observe that different publications are studying diverse factors affecting the development of a particular illness. Moreover, as we know, the factors that can affect the illness are not only clinical, but also environmental, including social.

Between most referred variables are: demographics, socioeconomic conditions, vitals, co-morbidity, discharge / admission parameters, length of stay, lab tests, procedures, medications, previous inpatient, outpatient and emergency services attended.

We can conclude that a lot of work has to be done but, as the topic is so complex, no single human brain can process the information needed. This situation requires and reinforces the use of computers and especially the machine learning approach to help us manage the situation. The published results are encouraging.

The use of sophisticated algorithms is not new. Twenty years ago, most disease management companies began to use them as a basis of the work done at call centres, especially in the U.S.. Initial predictive models also pointed in this direction. Actually, with the high computing capabilities, the use of predictive analytics has been exploited and it is used on accuracy of diagnosis of preventive medicine, personalised medicine, research on medications and health outcomes among others topics.

Hospital Readmission Prevention

Our solution, from a technological point of view, can be included in the field of machine learning (ML), but what does machine learning mean?

Machine learning is the part of computer science that allows machines or software, to learn by themselves from the information (data) they are analysing. In other words, they can self-configure in order to find the answer to a logical problem.

But ML is not only a computational tool, it also involves its own operative methodology, different from that of traditional software tools. This method is an iterative process by which the investigators can reach the solution of a given case of analysis, following a set of logical steps repeatedly until they find a satisfactory explanation of it.

The phases of this method comprise:

- Business Understanding: this initial phase focuses on

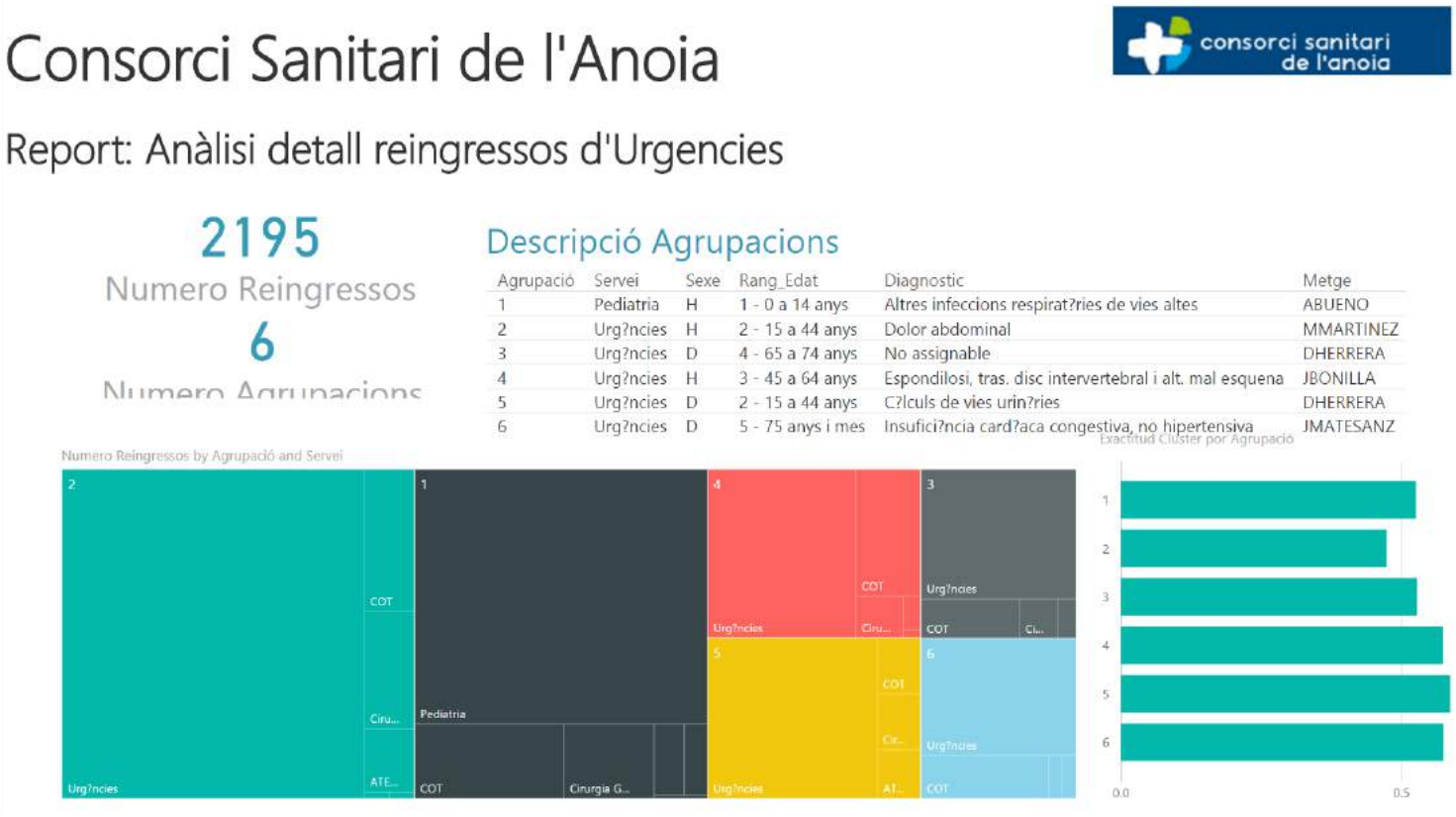

Figure 1: Hospital Readmission Prevention: Readmission Groups Main Characteristics. The figure shows 2,195 readmissions across 6 groups covering conditions such as respiratory infections and congestive heart failure.

understanding the project objectives and requirements from a business perspective;

- Data Understanding: the data understanding phase starts with initial data collection and proceeds to familiarising activities for the data;
- Data Preparation: the data preparation phase covers all activities connected with construction of the final dataset;
- Modelling: in this phase, various modelling techniques are selected and applied depending on the subject of study. Now is the time in which the input variables relevant to the case are selected, and the output variables are also defined;
- Evaluation: at this stage in the project you have built a model (or models) and you will compare them with the real data;
- Deployment: in this step the solution is delivered to the customer in the more adequate way depending on the project.

If we think of this, one could think that the ML process is very similar to scientific method itself. As it was explained by Richard Feynman in a rather humorous way in his lectures on physics; "first we guess" (understand the business aspects define the model and set the ML experiment) "calculate the consequences of our guess" (execute the ML process), and "compare the results with nature" (see if the results match the predictions provided by the ML experiment, evaluation step), then as we explained before, we can refine our model, to match the results with reality, in a more accurate way.

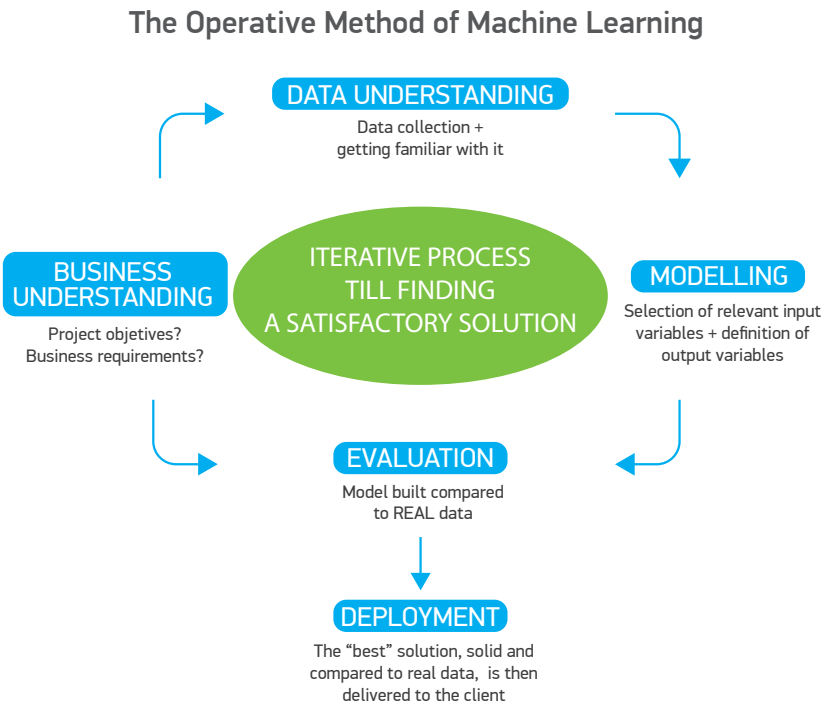

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Figure 2: The figure shows 37 readmissions in paediatrics with data on gender, year and responsible physician.

So this new generation of computer solutions implies a new way of working, and a new way of forming working teams. Technology can no longer operate in isolation from clinical knowledge, since they are explicitly involved in the same investigation process. This type of team will include typically (at least): A clinical expert, a data scientist (or person in charge of the ML development), a computer science professional and a data analysis coordinator.

Case Study

Let's then take a closer look at a particular ML solution, to see an example of the ideas explained earlier: Bismart's Hospital Readmission Prevention.

Bismart is one of the world's most innovative companies in the data analysis sector and its solution for readmissions helps to explore the causes of this phenomenon; reducing clinical cost and improving patient healthcare quality.

Bismart's Hospital Readmission Prevention tool provides the means necessary to locate where the readmissions of a hospital are occurring and find the reasons that are causing this undesired effect.

The tool uses machine learning techniques (clustering algorithms written in R language) that allow the user to discover groups of readmissions that may share a common cause.

From its component architecture's perspective, our Hospital Readmission Prevention solution is a cloud-based project, using mainly Microsoft's Azure Machine Learning and Power BI as main technological components. According to a previously defined statistical model, in the near future, this architecture will be combined with the interaction of wearables that will receive the prediction of readmission in a given time, by reading the vital constants of the patient and raising an alert whenever the health variables acquire certain values.

This structure allows us to provide the ML functionality by means of subscriptions to our service (software as a service concept), letting the hospital pay only for the precise use of the solution it needs, reducing costs, and giving the chance to employ the resources with the investigation itself instead of doing it on the software development/licensing.

The tool provides three main perspectives:

- Detailed analysis: once we know where (in terms of the variables of the input model) the main concentration of readmissions are, this perspective allows us to explore the details of the clinical episodes, one by one. After studying the information regarding a particular case, we will be able to find out relevant clues about the underlying and undesired cause of the readmission;
- Group characteristics: this view provides the information that defines the aggrupation that later will be used for detailed analysis. We also can visualise the accuracy of the different clusters;
- Readmission geolocation: this view enables the user to study where the readmissions are happening using map visualisation controls. With this report the user

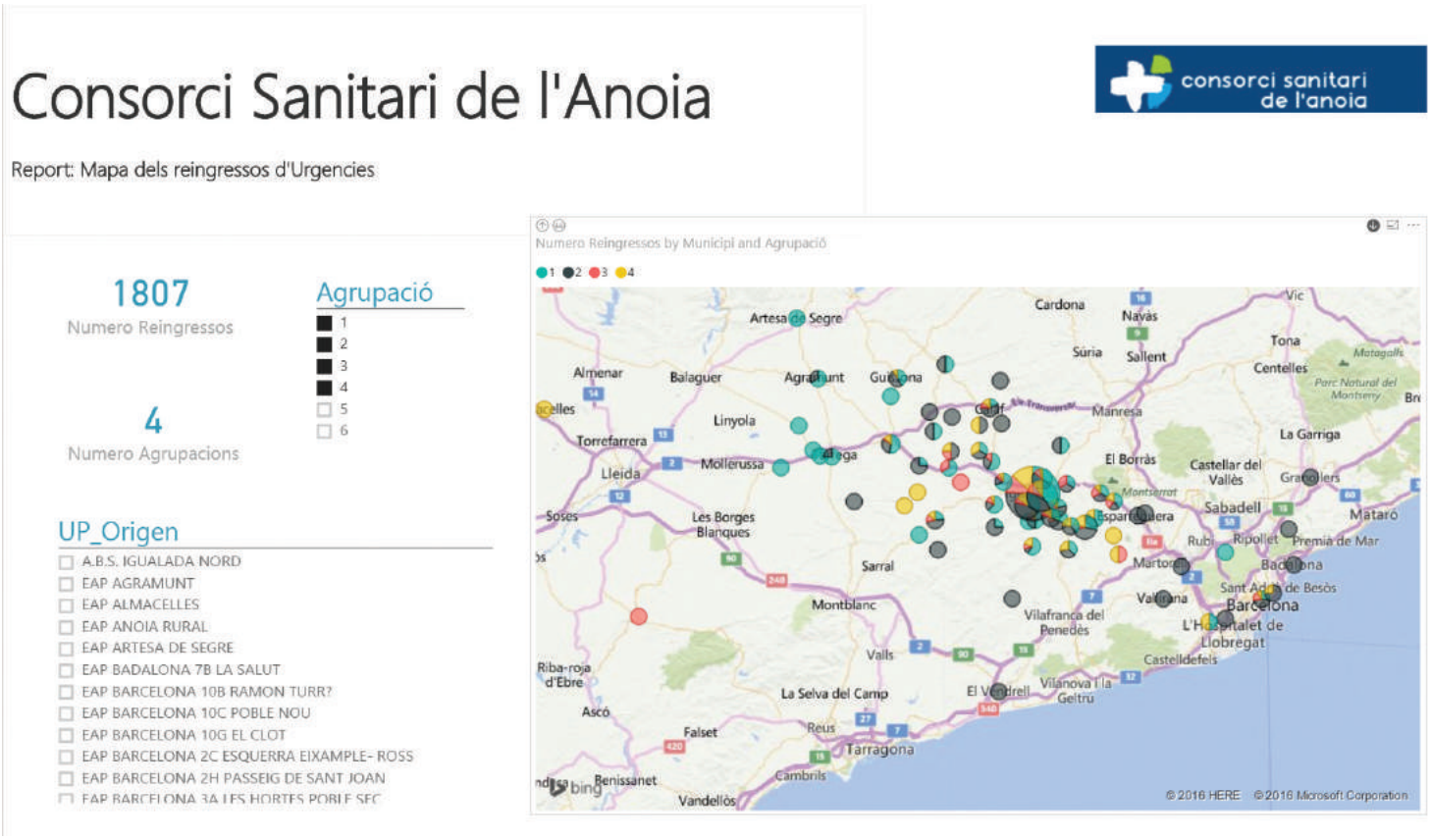

Figure 3: The figure shows where 1,807 emergency readmissions come from in the studied region.

will be able to ascertain if the reason for the readmission is related to the location of the patient (where he or she comes from in the surroundings of the hospital).

This knowledge is acquired thanks to modelling the globally-accepted "Integrated Care" approach. The next step, the emerging "Population Health Management" concept (use of data involved with the environmental and social determinants of health) is a good framework to allow clinicians, social workers or other professionals involved directly or indirectly in the health care to efficiently help patients.

Probably, we are now really at the beginning of the post-industrial era of health care services that are going to create dramatic changes in how we make health problems and their costs affordable. To this end, Parikh, Kakad and Bates have recently published an excellent approach introducing the concept "precision delivery" in JAMA (Bates, Kakad & Parikh, 2016). ■

Key Points

- ✓ Many diverse and complex factors lead to hospital readmissions. No single human brain can process the information needed to prevent it.
- ✓ Machine learning is a self-trained computer science solution that can help solve major health care issues such as the hospital readmissions.
- ✓ Machine learning projects transform the way the investigation teams work, their composition and the relationship among its members.
- ✓ This approach can be covered under the umbrella of the new concept "precision delivery".

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DESIGN FOR IMAGING

'MAKING IT WORK' VS. 'MAKING IT FIT'

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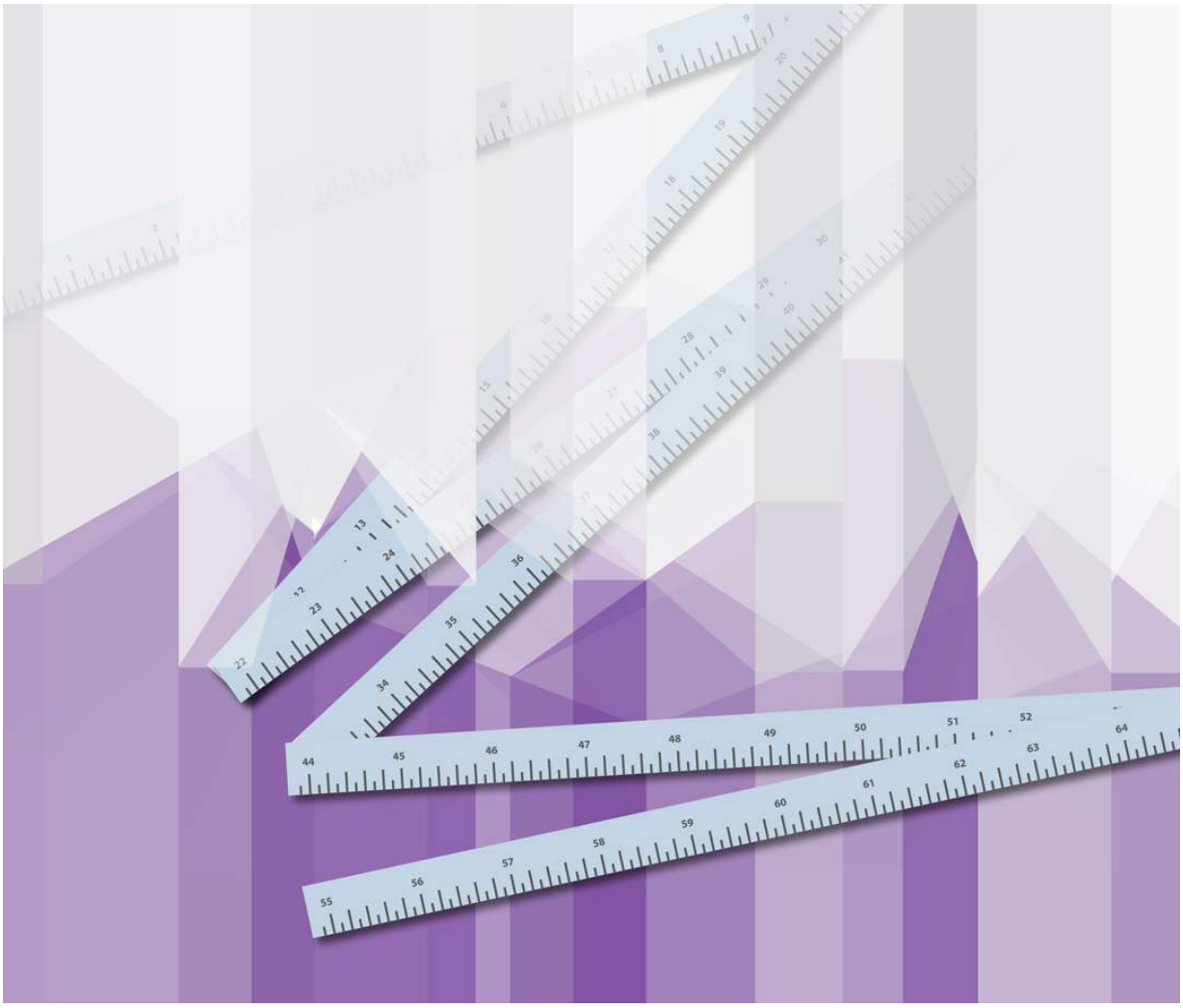


When it comes to design and construction, understanding a hospital's ongoing needs is "the single most essential piece". That is why siting imaging equipment often gets left to the last consideration, because the technical criteria have more objective answers. So, although 'making it fit' is rarely a problem, the more important goal will always be 'making it work, well'.

US Guidelines on MRI Suite Design and Safety

The most frequently used design standard in the US is the Facilities Guidelines Institute (FGI) *"Guidelines"* publication that covers all aspects of hospital design (not just imaging), and is updated every four years. I had been a subject matter expert on the imaging sections for the last two editions (2010 and 2014), and I am currently serving as a full committee member working on what will be the 2018 edition.

Imaging, in general, has been a challenge for FGI as the technology has been moving so quickly, particularly when compared with a four-year process for re-releases of the *'Guidelines'* books. The perfect examples of these are the two comparatively new 'hybrids' – hybrid modalities (e.g. PET/CT, PET/MR) and hybrid operating rooms (ORs).

Hybrid ORs (pairing imaging with surgery) aren't an entirely new concept, but the depth and breadth of image-enabled

procedures has grown substantially in the last ten years. If the line that separated intervention from surgery was blurry before, it is almost obliterated now. Today, it is impractical to define interventional rooms by a room name ('cardiac catheterisation lab', 'interventional radiology room', etc.), without defining what types of procedures might occur within. The level of intervention now capable in an 'interventional suite' is really akin to what would have been done exclusively in a surgical theatre ten years ago, making the prospective discussion of what types of procedures will be performed, and how the hospital will handle complications, essential initial planning tools.

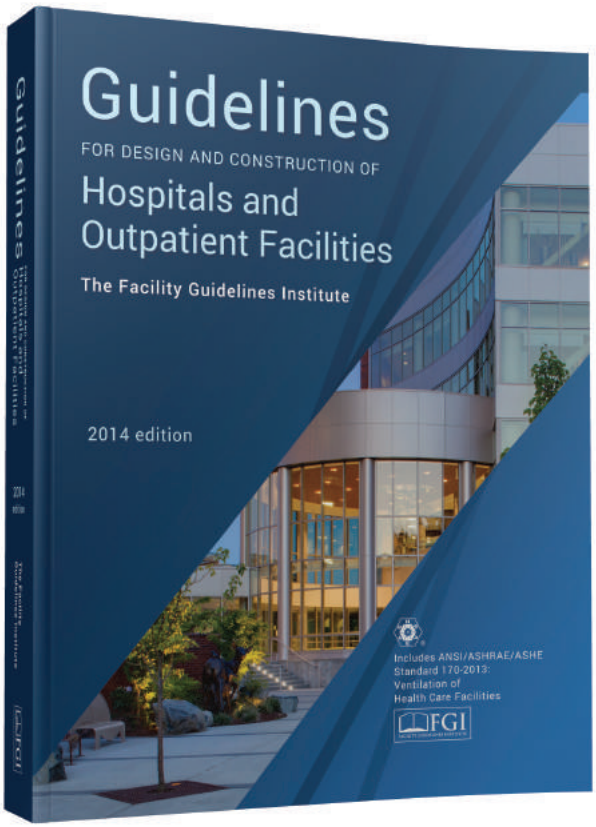
To this end, the 2018 *'Guidelines'* publication is planning to introduce an acuity / intervention classification system. Imaging rooms will be designated 'Class One', 'Class Two', or 'Class Three' depending on the clinical utilisation of the room. Basic diagnostic (only) imaging functions will be 'Class One'. Image guided minimally-invasive procedures or imaging requiring respiratory support will be 'Class Two'. And open surgical environments with imaging will be 'Class Three'. Each classification will have distinct requirements for clinical support, infection control, and sterility.

Hybrid imaging modalities are similarly complicated, though for different reasons. The clinical process and workflow for, say, a PET patient, and a CT patient, are profoundly different. When these two modalities are fused into a single piece of imaging equipment (PET/CT), the least of the designer's problems is the room in which the scanner goes. Yes, the room likely needs to be on the order of 1.5m longer than a conventional CT scanner room, but that's comparatively easy.

PET patients need to have injections of radioisotopes, and typically need to remain still for 45 minutes to an hour following injection and prior to imaging. Whereas CT is today a speedy exam (a cardiac CT examination can often be accomplished in less time than it takes to get the patient comfortably positioned in the correct spot on the table), PET exams have a much different timetable.

And - in the US, at least - CT radiographers and PET radiographers have entirely different training and certifications. Even the departmental structures (radiology vs. nuclear medicine) are most frequently separated. So, staffing and training for hybrid modalities can become a challenge, along with questions of authority and 'ownership' of a hybrid. This aspect will only get more complex with new hybrid MRI linear accelerators that are currently available, and future three-way hybrids.

In both 'hybrids' (hybrid OR and hybrid modalities), the circumstances really demand that facility planners and designers have very detailed conversations with the hospital clients to understand their operational wants and needs prior to designing the spaces. While we do give these spaces labels that might suggest that they are off-the-rack items to be selected, they really need to be approached with the expectation that they are really bespoke, tailored to the specific needs of the client.



> ***"IF THE LINE THAT SEPARATED INTERVENTION FROM SURGERY WAS BLURRY BEFORE, IT IS ALMOST OBLITERATED NOW"***

Universality of Guidelines and "Cross Border" Compatibility Issues

In the US, design and licensure standards are set by each state, individually. Fortunately, the overwhelming majority of them recognise the FGI 'Guidelines' for their state standard. Even those that have developed their own standards often base their criteria (largely) on the FGI 'Guidelines'. National accrediting bodies, such as The Joint Commission refer to FGI as the default standard, if a facility is in a location that doesn't have a state or local healthcare design standard.

'Guidelines' is not quite universal in the US, but it is far and away the single most widely recognised design standard for hospitals and healthcare construction.

With the new classification system, it means that hospitals and designers will need to be having more in-depth pre-design conversations before MRI projects begin. 'Will this suite support high-acuity patients? Will it support heavy sedation / general anaesthesia patients? Will it support image-guided

procedures?' The answers to these questions will help drive the design criteria for the imaging suites.

If imaging equipment manufacturer 'typical' MRI suite templates were ever sufficient (and I would argue that they never have been), they certainly won't be once the acuity classification system is introduced. The same will be true for other imaging modalities.

Keeping Up With Regulations – Another "Magnetic Elephant in the Room"?

There absolutely are some design expectations that are being driven by newer technology and clinical applications, but from an MRI safety point of view, what designers are being asked to do, today, is really what was outlined almost 15 years ago in the original American College of Radiology (ACR) White Paper on MRI Safety (subsequently rewritten and reissued in 2004, 2007, and most recently in 2013 as the ACR Guidance Document on MR Safe Practices). What is being codified as design standards today has really existed as an industry best-practice for well over a decade. It was unfortunate that architects, engineers, equipment planners and facility managers didn't uniformly embrace MRI safety design best practices, but the new design standards will help to assure that newly renovated and constructed MRI suites will adhere to these as minimums.

> ***"STAFFING AND TRAINING FOR HYBRID MODALITIES CAN BECOME A CHALLENGE, ALONG WITH QUESTIONS OF AUTHORITY AND 'OWNERSHIP' OF A HYBRID"***

The Future of Design in Radiology

Radiology today is being compressed. It used to be that providers offered conventional X-ray, ultrasound, or bone densitometry as necessary services, but counted on CT and MRI to generate the overwhelming bulk of their revenue / profit. In the US, the reimbursement levels from insurers were high enough for CT and MRI that it really didn't matter if the other services paid for themselves. In fact, some pretty poor design and operational practices were institutionalised in the US when these services were awash in reimbursement.

Today, with decreasing reimbursement, outcome-based payments, and resulting pressures on increasing patient volume, many existing facilities / providers in the US are finding themselves ill-equipped to respond to the new paradigm.

Radiology facilities today need to focus on operational efficiency as never before. If a CT study can be complete in less than five minutes, then that CT might be able to image 6-8 patients per hour. If the facility design is a carbon copy of prior imaging suites from years ago, it likely doesn't have the patient management / preparation spaces and features that are necessary to support the capacity potential of the scanner. Why spend 1-2 million Euros on a high throughput scanner, only to cut that potential in half through a poorly planned facility?

The difficult truth to this is that there are no copy-and-paste prototypes for the new economic realities for medical imaging. Architects and equipment planners who simply provide a 'garage' for the piece of equipment, and don't help the hospital crystallise their operational goals, are doing their clients a grave disservice.

Hardware Fatigue, Used MRI Systems and Software Updates

Medical imaging equipment just continues to get better and better... much of it lasting longer and longer. This has been a benefit for hospitals riding out the economic downturn of 2008, as there wasn't the capital available to replace equipment on the prior schedule. Older equipment and used equipment isn't necessarily bad, and it can reduce first costs (though I argue that operational efficiencies should always be a higher priority than first costs), but it does necessarily limit the features and functions that are available to the hospital.

As an example, I have a first generation iPad. It still works... there is nothing physically wrong with it. But it cannot accept the latest system software updates, which means that it can't accept new programmes that depend on the newer system software. I can still check my email, browse the web, or download music, but I can't take advantage of applications that have been released in the last few years. Older CTs and MRIs are quite similar in this respect... they may work equally well as when they were first released, but they will likely never compete with newer equipment in terms of the range of functionality that they can support.

Physical Screening and Changing Areas

Screening and changing areas are also essential parts of this emphasis on efficiency and throughput, along with patient sub-waiting areas. These are also elements that are not typically portrayed in manufacturers' equipment siting prototypes, and therefore don't get appropriate consideration when designs begin with vendor templates.

When working with clients to design imaging spaces, I like to start with their ultimate end-goals (e.g. 'x number of imaging studies / day or week'), and back up from there. When the goal is 'site the MRI scanner we're purchasing', that really only addresses the short-term goal, but not the persistent condition that the hospital will need to live with for years and years. I prefer to identify that ongoing condition, and the hospital's expectations for that. To a skilled radiology designer, simply siting MRI equipment is not difficult. The challenge is in siting it such that it brings the greatest value to the hospital.

Access Control

Ionising radiation-emitting modalities, like X-ray and CT, have one set of controls that are typically tied to the operation of the X-ray tube. MRI and nuclear medicine have different access controls (both from CT and from each other) based on

persistent risks. Each of these need to be honored, individually. Particularly when we begin mashing together modalities with very different access restrictions into hybrids (i.e. PET/MRI), the overlapping and conflicting access controls can get complicated. It often takes some creativity and a very careful evaluation of the operational model (for example, is it the hospital's intention to do a large proportion of their studies as simultaneous PET and MRI exams, or will the majority of the patients be only one or the other?) to develop a layout that honours the safety and access restrictions of each of the combined modalities, but also allows for efficient operation.

Accommodation of Site-Specific Clinical and Operational Requirements

This is the single most essential piece. It is, after all, the part about understanding the hospital's ongoing needs. When it comes to siting imaging equipment, this often gets left to the last consideration, because the technical criteria have more objective answers. I understand this sequence for comparatively inexperienced designers, but in my opinion it is totally backwards.

'Making it fit' is rarely a problem. The more important goal will always be 'making it work, well'. For this, I never start with the equipment manufacturer's minimum technical siting criteria, but with the owner's clinical and operational requirements... both today's and a reasonable forward-looking notion of what might be added in the years ahead. ■

Key Points

- ✓ The 2018 facilities' guidelines will see imaging rooms designated depending on the clinical utilisation.
- ✓ Staffing and training for hybrid modalities can become a challenge, along with questions of authority and 'ownership'.
- ✓ There are no copy-and-paste prototypes for the new economic realities for medical imaging.
- ✓ Architects and equipment planners who simply provide a 'garage' for the piece of equipment are doing their clients a grave disservice.
- ✓ To a skilled radiology designer, simply siting MRI equipment is not difficult. The challenge is to bring the greatest value to the hospital.

Patient Interviews and Clinical Screening:

In the U.S., at least, we handle the pre-appointment information-gathering very poorly.

As a point of comparison, I was driving on a road trip last year and stopped at a gas station / convenience store. That store had an electronic kiosk for ordering pretzels. By touching the screen you could order it heated or not, with salt or without, and with your choice of sauce. After ordering, it spat out a ticket with your order number, and your position in the queue was displayed on a monitor. When they had prepared your order, your ticket number was called by an automated voice.

I look at the amount of automation and intelligence in a roadside store's system for ordering pretzels, and I compare that to the way in which we ask patients for pre-appointment information, and I almost weep.

Particularly for MRI (though also true for other imaging services), the collection of patient information and effective pre-screening is essential to efficient throughput. This is something that the industry needs to do a better job of designing into the whole process, and not trying to add it like a barnacle.

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DESIGNING A HOSPITAL CARDIOLOGY OUTREACH SERVICE

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The cardiology team at Sheffield Teaching Hospitals NHS Foundation Trust successfully designed and implemented an outreach service for heart failure patients in non-cardiology wards (National Institute for Health and Care Excellence 2014a). The service was required as cardiologists care for around 18-25% of heart failure patients, while 75-78% are under the care of non-cardiologists. In addition, outreach is recommended in the UK National Institute for Health and Care Excellence (NICE)'s acute heart failure guidelines (NICE 2014b). *HealthManagement.org* spoke to consultant cardiologist and service lead, Dr. Abdallah Al-Mohammad, to find out more.

How were cardiac patients in non-cardiac inpatient settings treated before the heart failure outreach service was set up?

Prior to the establishment of the heart failure multidisciplinary team meeting and ward rounds, patients with heart failure admitted into non-cardiac beds were treated by their physicians, who were attempting to follow the guidelines while addressing the multiple co-morbidities that these patients frequently have. However, not infrequently, the majority of these patients (72-75 percent) were not receiving evidence-based therapy mandated for those patients with heart failure with reduced left ventricular ejection fraction (HFREF). The chief reasons for the low uptake of these medications were concerns about low blood pressure and abnormal renal function in addition to remaining doubts amongst some physicians about the wisdom of beta-blockers in certain subgroups of patients with heart failure.

> ***"TAKE CARDIOLOGY EXPERTISE TO THESE PATIENTS WITHOUT TAKING OVER THEIR CARE"***

Why did you decide to set up a heart failure outreach service?

As a tertiary cardiac centre our specialist beds are in significantly high demand, preventing us from accommodating all patients with heart failure within our bed complement. In addition, I was dismayed by the very low percentage of uptake of therapies such as ACE inhibitors and beta-blockers amongst the patients with heart failure admitted under the care of non-cardiologists (these patients constitute the majority of the patients with heart failure in our hospital). I proposed that one could take cardiology expertise to these patients without taking over their care. Thus, we provide these patients with cardiology opinion and advice, while keeping them under the care of their respective physicians, who are best suited to look after their other co-morbid conditions.

Thus we avoid using our tertiary centre cardiology beds for those with heart failure who do not require non-pharmacological cardiac interventions.

How did you set out to design this service? Who was involved?

I started by gathering support for the idea of the creation of a new heart failure service within my departmental management team. We then presented a paper outlining the aims of the service to the hospital's management team. The hospital's management set up a project that included two interested cardiologists, three general physicians (one diabetologist and two geriatricians), a nurse director, a nursing matron and a manager. We set out the vision of the project based on my suggestions, and then we were tasked with looking into the steps needed to create the collaborative type of service that could work across departmental borders, with the aim to provide patients with heart failure who are under the care of non-cardiologists with the cardiology expertise needed to afford them the best evidence-based treatment for their heart failure.

We concluded after a few months with a service design that was agreed with the department of medicine and with the hospital management before we started applying the agreed changes. We appointed more heart failure specialist nurses and trained the general medical nurses, who will look after the majority of the patients. We tried to concentrate the patients in a geographical area within the department of medicine.

What did you perceive as the main barriers and challenges to setting up this service?

Physicians are naturally independent medical practitioners. While they welcome the help of certain specialists when they ask for that help, the model of our heart failure multidisciplinary team dictates in addition to responding to referrals from the physicians and the nurses in the general medical ward that we also seek out potential patients with heart failure even if not formally required to do so. In addition, our participation included further involvement with and advice provided to the patients and their caring nursing and medical teams without necessarily being asked to do so. Winning the trust of all these practitioners was at times difficult and required patience and perseverance along with exercising the utmost respect to the integrity and the independence of the caring doctors and their teams.

The service significantly increased my personal workload as I continued to provide general and specialist cardiology care to my own patients. Subsequently I was able to demonstrate that more help was needed to enable me to deliver the service that expanded significantly over time. Now the heart failure multidisciplinary team ward rounds are delivered by four cardiologists (instead of just one - I was doing this alone for a considerable length of time). We are about to expand the team to five cardiologists.

What are the critical success factors for this service?

- Collaboration and trust that was built with the physicians delivering the care to the majority of the patients with heart failure;
- Team working environment with the nurses and the administrators as well as the managers in the heart failure service;
- Continuing involvement of the managers and representatives of all those involved in a monthly meeting to manage any difficulties that may arise in the conduct of the service;
- Perseverance and commitment by the heart failure nurses and the cardiologists with an interest in heart failure;
- Creation of a learning environment for both the heart failure nurses and the junior cardiology staff attached to the team.

What makes for successful inter-departmental collaboration? How did you gain acceptance and get buy-in from other clinicians?

- Proving to colleagues that all I needed was to simply help them better manage their patients' conditions with no personal agenda beyond that;
- Proving to colleagues that the involvement of the HF team had actually resulted in better therapeutic uptake and better outcomes for the patients;
- Respecting everyone involved in the delivery of care for these patients as equal partners and avoidance of any implication that may be perceived as undermining their work or their authority;
- Setting up an annual meeting for the service where all those involved are invited to attend a review of the achievements by the service and the difficulties faced or perceived in order to openly discuss those and consider solutions.

You increased staffing for this service after the initial setup. What factors make this service sustainable?

We monitor the performance of the service and the difficulties encountered by the members of the team, and we attempt to persuade the management that further increases in the number of staff are genuinely required. We also work with the management on ways to ensure the best efficiency is achieved by the team prior to expansion as well as looking at ways to make any increase in the staff justifiable and paid for through improved direct or indirect productivity. ■

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REDESIGNING A CARDIOVASCULAR SERVICE LINE

THE IMPORTANCE OF CULTURE

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When Minnesota Heart merged with University of Minnesota Physicians, the cardiovascular service line was branded and redesigned, which involved integration of services across the academic medical centre and community hospitals and clinics. *HealthManagement.org* spoke to Rebecca Stepan, who was Director for Clinical Quality at the time, about the factors that led to a successful re-design.

How did you start to redesign the quality structure of the cardiovascular service line?

When the service line became the University of Minnesota Health-branded service line, Debra Rudquist was appointed the service line executive and I was hired to manage quality and to grow a quality team across the whole service line. This was done with partners on the academic medical centre side and on the community side. The focus was first on integration and the teams were called horizontal integration teams.

We knew that there would be a lot of culture work to do before we could move forward with improvement. The culture and practices are quite different between academic medical centres and community health services – for example in relation to prevention, intervention and surgery. We needed to come together and find common ground. For at least the first six months of my 18 months on the programme I worked on the culture and integration. The quote from Peter Drucker, "Culture eats strategy" is well known. No matter how we would have strategised the new structure, if we didn't have the culture first this would have failed and our leadership recognised that.

Our first focus was on patient access and satisfaction. We focused on services across the service line where it was proper for the transfer to occur from a community hospital to a tertiary care centre and for cardiologists to hand off to another sub-specialty. Once we found those common threads we could start working on patient journeys.

How were patients involved in the redesign?

Patient experience was one of our top strategic priorities, and we had a patient experience committee. As well as using

retrospective data we worked with a health technology company to get rapid cycle feedback. Using tablet-based surveys we could get live answers from patients, targeted by population, with questions based on new models of access that we were designing in our service line. We also looked at the patient experience across the continuum of care. We targeted patients at admission, at discharge and up to nine months post-treatment. We stratified the results to see if patients were readmitted or admitted to the emergency room (ER), and also to see if patients who had a particular treatment or struggled with medication adherence were more likely to get re-admitted or go to the ER, for example. The process was very much data-driven.

What other challenges were there at the start of the redesign?

One example is finding space and funding for video conferencing rooms. This was important to get everybody involved and engaged and able to see each other, especially the personnel at different hospitals or clinics. That helped a lot when we first got started. It seems trivial, but if you don't put that in place, the teams just aren't as robust and not as likely to work together well as a true team.

> *"... A LOT OF CULTURE WORK TO DO BEFORE WE COULD MOVE FORWARD WITH IMPROVEMENT"*

The redesign project used Lean Six Sigma tools. What did these include?

Value Stream Maps look at waste in a production system, as originally developed by Toyota, GE and Ford. We built them as a patient journey map, and looked at where the patient is waiting, where patients spend time not receiving care. We mapped this as a patient journey to see where there is waste and time spent that is not valuable to the patient. For example, when patients were scheduled for a valve or coronary artery bypass graft surgery there is a lot of pre-op education and lab work. By looking at the whole day for the patient we found that there is a lot of time where the patients are waiting. Sometimes the labs were scheduled later in the day and they were still fasting, and they were hungry. We were just looking at when it was convenient for the labs, for the nurses and physicians and what worked in our schedule. We were able to rearrange clinic schedules and appointments, so that the patient didn't have to wait to eat anymore. If you don't focus on it you are never going to make an improvement. To quote Don Berwick from the Institute for Healthcare Improvement: "You have to change your process to get different results."

Structural changes were also critical. We produced Team Charters, which included the team purpose, deliverables, membership, reporting and how often it meets. The teams report up to the steering committee and to the board.

We demonstrated statistically significantly improvements in our patient care and experience. In the Press Ganey® Clinician and Group Consumer Assessment of Healthcare Providers and Systems (CGCAHPS) we received top scores for provider, front desk and staff communication across all the heart clinics. These improvements have been sustained.

What organisational changes took place for the redesign?

The most important was establishing the Performance Excellence Alignment and Knowledge (PEAK) teams. These evolved from the original Horizontal Integration Teams. We inverted the regular organisational chart, where the CEO is at the top, then the VPs, directors and so on. We drew it upside down, so that the board was at the bottom and the PEAK teams were at the top. For the redesign the PEAK teams had autonomy. Each PEAK team had a community position and an academic position alongside me as quality administrator. The team included nurse representatives from inpatients, outpatients and clinics as well as data abstractors – registries are very important in heart care. We designed with our teams what our improvement efforts were and what we wanted on our dashboard. We reported to the steering committee for the service line and to the board.

These PEAK teams still exist, and they have taken on even more ownership of the work. The credit for the idea of the PEAK teams goes to Dr. David Laxson, a cardiologist at the University of Minnesota Health. He coined the term, as he saw that we were moving beyond integration and it was time to start striving and working at the top of that Maslow hierarchy of needs. Service Line Executives Dr. Laxson, Debra Rudquist and our quality physician leaders Dr. Stephen Battista, Dr. Robert Bache, and Dr. Ganesh Raveendran gave us the vision of getting up to the peak and staying there.

What was the most important lesson learnt from this process?

The dynamic between culture and strategy is so important. We thought the strategy would be most important, but we recognised that strategy is part of culture and we needed to spend time on the culture rather than just get up and get going. We had to be patient, get the structure in place. This is what contributed to the PEAK teams being able to thrive, and the structure of the teams directly impacted the care, the quality improvements projects, what we were measuring. If you don't measure the right things then you will never know you are not improving the right outcome. We saw our outcomes improve by having the multidisciplinary PEAK teams as part of our strategy after the work on the culture. This happened in 18 months overall.

Rebecca currently works for Transplant Services, where they have successfully replicated the same model. The intent is to emulate the model now in perioperative and other services. ■

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DESIGNING A SPECIALIST CARDIOLOGY SERVICE FOR RURAL QUEENSLAND

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Heart disease is the leading cause of death in Australia. However, people living in rural and remote Australia are 44 percent more likely to die of heart disease than people living in urban areas. (Australian Bureau of Statistics 2011). Brisbane cardiologist, Rolf Gomes, decided to do something about this disparity by equipping a mobile cardiac service to tour rural Queensland. From idea to reality took around 6 years, and the Heart of Australia service has been running successfully for 18 months. The mobile clinic, which is wheelchair-accessible and air-conditioned, includes two private clinic rooms, a testing room and a reception area for patients. *HealthManagement.org* spoke to Dr. Gomes to find out more.

What prompted you to bring specialist cardiology services to rural Queensland?

Prior to doing medicine I was an electrical engineer. Engineers recognise how combining a solution in one discipline with the problem in another can achieve an outcome. I thought with miniaturisation of technology and internet connectivity perhaps we could mobilise not just the specialist in the flesh but the technology that reflects the day-to-day practice of modern medicine out into some of these remote areas where these services are lacking. After finishing my cardiology training, I established my private practice in Brisbane, Medi Hearts. But every time I walked into my practice, I thought: "Why can't we just take this equipment, encapsulate

it into a mobile entity of some sort and deliver these services to the doorstep of communities where these services are non-existent?"

In Australia distances are vast and can be a burden for patients, who are generally elderly. Some of them can't afford the costs of travel and accommodation, some have time-consuming professions like farming or they have caring responsibilities. For a multitude of reasons there are barriers to patients discussing their symptoms with their general practitioner (GP). Often GPs operate with a certain degree of anxiety, because they know that they are dealing with patients and symptoms that they perhaps cannot refer for further investigation and should, because of resistance from patients to travel and the associated costs.

My journey with the Heart of Australia programme began about 6 years ago when I wrote to 181 GPs in rural Queensland and asked four questions: 1) How many patients do you currently see a month with cardiac symptoms? 2) What percent of these patients is indigenous? 3) How many patients do you currently refer? 4) If you had a service like this at your doorstep how many would you then refer? It became fairly obvious that there is a gap in referral, simply due to access to services.

> *"INSTEAD OF TRAVELLING THOUSANDS OF KILOMETRES FOR A FIFTEEN-MINUTE CONSULTATION WITH A CARDIOLOGIST IN THE CITY THEY COME AND SEE US"*

What gave you the idea of a mobile clinic?

Personally I don't want to travel a thousand kilometres with just a stethoscope and say to a patient that they might have heart disease and now have to travel 1000km to the city to have a stress test. It is almost like a painter turning up to your house without a paintbrush. In the mobile clinic we have ultrasound machines, treadmills, heart rhythm monitoring devices, equipment which can do full lung function testing and even overnight sleep apnoea testing. We are not just bringing the specialist expertise, we are bringing transportable health infrastructure to these communities.

Some of our IT infrastructure has been specifically designed with enough redundancy and enough telecommunications inside to allow it to operate in these conditions. Most of the equipment is the same as you would find in a city practice. Having the noninvasive diagnostic equipment available makes an enormous difference. We can reassure patients that their heart is probably fine and thus support the health practitioners in these communities. If after preliminary investigations performed on the truck patients need more advanced imaging, such as MRI or CT or an angiogram, then their threshold for travel is much lower, compared to if they have pain in the chest and have to travel 1000km there and 1000km back to find out if it's the heart or reflux.

What were the main challenges in setting up the Heart of Australia service?

The first one was to find the workforce. I spoke to my colleagues in one of the largest private cardiologist groups in Queensland and asked them if they would be prepared to man the roster, if I funded this service, built the truck and found the supporting staff. I had some agreements in writing from that group, then for about two and a half years after that it was a lot of very hard work to find some likeminded organisations to sponsor the process.

How did your engineering background inform the development of the Heart of Australia service? How is it innovative?

Engineers always have to find a way to convert an idea into reality. In this case it was not a problem with a lack of the medicine, it was about finding a mechanism to bring what currently exists out into these regional areas. The more I thought about it, I thought there is no real reason why we can't do this. A lot of the initial objections to the idea were based on conjecture, not fact. For example, there were concerns that patients wouldn't turn up to a truck, and some questioned whether the specialists would continue to be interested.

There is technology innovation and the service delivery model is innovative. What is lacking is an organisational framework. In Australia we have the Royal Flying Doctor service, which is a nationwide aeromedical service delivering primary healthcare and emergency services in regional areas. But there is no unifying body for delivering specialist services to regional areas. The real innovation will be to take extra time, money and effort to form such an organisation for delivering specialist services sustainably. That is my vision. We would like to see Heart of Australia evolve into the land-based equivalent of the Flying Doctors, to deliver specialists into the future. This will enable specialists to participate in rural services without feeling like they are taking on the commitment and logistical burden of setting things up for themselves and also the psychological burden of letting the whole community down if they couldn't continue.

In our 18 months of operation, we have provided a cardiology service to 12 remote communities across Queensland. Some of these places had been struggling to find even a GP. Now we provide a cardiologist in person every month and we have a state-of-the-art cardiac and respiratory clinic every fortnight. Other parts of Australia are interested in replicating the service.

Why is the public health service not providing this facility?

Government has a responsibility to provide essential health infrastructure to these regions. I don't think what we are providing is a luxury. People out in rural and remote areas are getting older, and everyone's got a heart! In the past there may have been a lack of options in terms of bringing specialists out there in a sustainable fashion, but now we have a programme which is up and running and delivering solid

health, social and economic benefits for patients, communities and Government. We are hoping we can partner with Government to assist with the sustainable delivery of healthcare out in these areas.

What do patients have to pay to use the service?

It is more benevolent than my private city practice. Some of these areas have quite polarised socioeconomic demographics. You can't really bring this service into a small community and exclude a part of the population simply because they can't afford to pay. We try to balance altriusm with pragmatism, and ask the GPs to let us know the patient's situation on the referral form. Our costs are above and beyond a normal medical practice – tyres, truck driver wages for example. We are very fortunate with our sponsors. The game changer for us would be if government decides to play a role in funding our service. That would give us medium-term security and allow us to plan for expanding the service to other regions and expanding the benefits to other populations with similar needs.

> *"WE WOULD LIKE TO SEE HEART OF AUSTRALIA EVOLVE INTO THE LAND-BASED EQUIVALENT OF THE FLYING DOCTORS"*

What data are you collecting about the service that will assist in making your case for government funding?

We collect as much data as we can with the limited resources we have. We get 400 new patients referred every three months, we have seen over 2000 patients since the service was set up and we are getting busier and busier. We are at saturation point with one unit. We would like government to support us in expanding our service to two trucks to provide a service to the whole of Queensland.

In the first six months of operation I was visiting three communities, and I referred nine patients for open heart surgery. That's a fairly high pickup rate for a significant pathology. These were patients who if they hadn't had that operation would probably be dead. Most of those patients would have never seen a cardiologist and they weren't experiencing such acute symptoms that they needed to be flown out. In the last 12 to 18 months, we have seen around 70 patients who are alive now who otherwise might have been dead. This doesn't include all those patients with cardiac conditions who require a regular follow up. Now instead of travelling thousands of kilometres for a fifteen-minute consultation with a cardiologist in the city they come and see us.

What are the critical success factors for the service?

We had a very clear idea from a management perspective of what we were trying to achieve. We try and see as many patients as we can, and about 92 percent of our patients attend, which makes a very low "no show" rate. To be successful you need a very committed team that is attached to the programme. The whole purpose of what we are doing in these areas has to resonate very deeply, because it does require a lot of work. Having the support at grassroots levels—from GPs, councils, patients and local businesses—is absolutely critical to being successful. All our patients are referred by GPs, so we need to really understand what the needs of those GPs are and deliver a first-class service that they find useful.

Financially there are a lot of expenses, but there is no wastage. The question we hear more and more frequently is why isn't the government supporting you? This is now a pseudo public service. In the communities we visit a lot of our referrals are coming from patients who began their health cardiac journey by presenting to a public hospital. We are now supporting those regional public hospitals by seeing their patients, who prefer to come to us than join a long waiting list to see a cardiologist or be referred to a tertiary centre.

What have been the lessons learned?

The main lesson is that you don't know what the burden of the disease or demand for services are going to be until you get out there. For example, Charleville never had a cardiologist. Yet now our clinic in Charleville is booked two months in advance, because we have patients who don't want to travel for follow up, and GPs send us patients with chest pains — in the past they didn't know where to send these patients. We have discovered some technological aspects along the way to do with internet bandwidth capacity. And I've had to learn about things I previously had no idea about, such as transport, main road guidelines, driving safety and fatigue management. I've had to learn all the intellectual property associated with this programme.

In healthcare this is what heath innovation looks like. This is an example of an interesting model of care, which is delivering solid outcomes. In terms of the burden of chronic disease and an ageing population, how you are going to look after these people in the future, unless you find models of care that have the potential to save you money?

How do you divide your time between your private practice in Brisbane and the Heart of Australia service?

I also have three young children, so balancing 'Dad' time with private practice time and then running a statewide mobile cardiac service is not easy. I am very efficient and have a lot of capacity for hard work. I also have a very supportive team. You need to delegate some of the responsibility to the team, and if the programme grows as I anticipate, more will need to be delegated. ■

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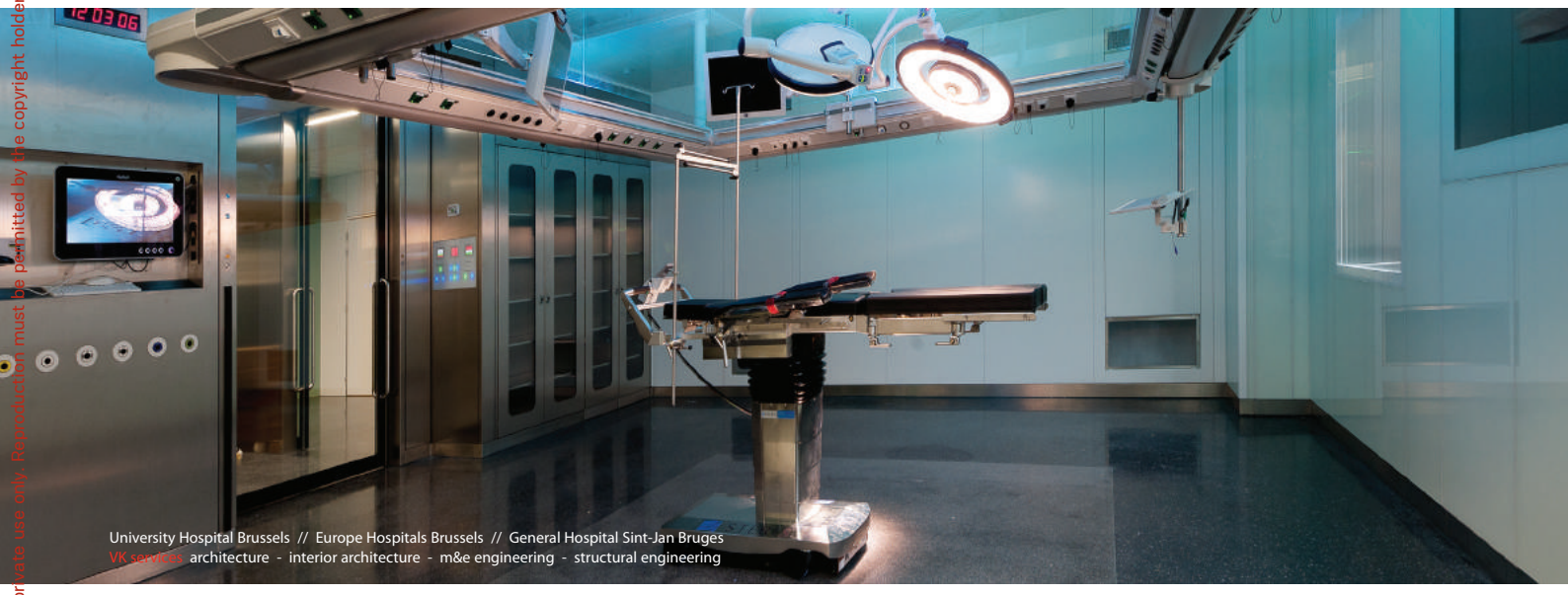

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SUPPLY CHAIN MANAGEMENT SUCCESS STORY

CANADIAN SUPPLY CHAIN MANAGEMENT ASSOCIATION OFFERS NEW TAKE ON STANDARDISING COSTS AND PROCESSES

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Persuading surgeons to recognise the benefits of supply chain management in the operating room is no easy task. But Martin Montanti has done it.

As vice-president for corporate services at Southern Health-Santé Sud, one of Manitoba's five regional health authorities, Montanti has overseen an ambitious project that aims to standardise not only supplies but also procedures at several dozen hospitals, long-term care centres and other healthcare facilities.

"The most important thing that logistics and supply need to do today and in the future is to understand the value they add to the organisation", Montanti said.

"They have evolved from being about the cost of an item into developing processes that improve how people do their jobs."

This expanded role for supply chain management is especially important in the context of the drive by governments across the country to contain spiralling healthcare costs.

Best Practice

A recent study by Western University indicated that many doctors have little idea of the cost of the items that they use. The authors asked ear, nose and throat specialists in London, Ontario and Montreal to estimate the prices of 23 common disposable items, such as syringes. More than two-thirds gave answers that were more than 50 percent shy of the real cost.

Supply chain managers are therefore in the forefront of helping doctors and hospital administrators question traditional processes and introduce new, cost-saving technologies.

Southern Health covers an area of more than 27, 000 sq km. It serves 190, 000 residents, including seven First Nations communities, and employs 5, 600 people.

Key Points

- ✓ Supply Chain Managers can play an important part in standardising both supplies and processed.
- ✓ An expanded role can help curb healthcare costs.
- ✓ Few medics know the cost of the items they use.
- ✓ Communication about useful standard products helps streamline supply chain costs.
- ✓ Products standardisation results in major annual savings.
- ✓ Meeting demand of medics creates trust and results in effective supply chain management.

Montanti, who worked for a bakery and an aerospace company before moving into the healthcare sector, notes that "logistics and supply departments are not going to be the senior bureaucrats of the organisation where you can wave your wand and everyone is going to watch you. You need to lead from behind."

Team Effort

Manitoba's standardisation drive began even before Southern Health was created in mid-2012 through the merger of 11 health authorities into the current five regions.

"Everybody was doing their own purchasing, and everybody was purchasing their own items, often from different vendors", Montanti says, citing 28 different gauze pads as an example. "The users never even talked to each other. They all did their own thing".

The first step in bringing some order to the chaos was to set up "standard teams", each covering a specific function, such as acute care and operating rooms. Staff from the region's various institutions were encouraged to come together and decide on standard products that would suit them all. It wasn't long before the conversation turned from ordering gauze pads to the most efficient way of performing colonoscopies—and every other kind of medical procedure.

Montanti recalls that participants started to ask questions like: What scope (a flexible tube with a tiny camera at the end) is best suited for colonoscopies? Which techniques work best for each scope? Who should be present in the operating room? How many anaesthetists are needed for an operation? The list went on and offered more solutions.

Trust and Cooperation

Using standard products has cut the surgical programme's cost of supplies by 30 percent, Montanti says. The saving in orthopaedics alone came to almost $300, 000 (CAN) in a single year.

Montanti attributes much of the success to mutual trust. "If I were to call up those surgeons and say 'I want you guys cutting patients all the same way', their response would be: 'Who are you? Martin who'?"

But, he adds, "if we get together and I say "Hey, guys I want to get you items that really help you do successful surgeries and I need your help', then they're in control. All I did was to create the environment for them to talk together. I didn't create the demand. I filled the demand." ■

DESIGN

"THE HOSPITAL IS A HUMAN INVENTION AND AS SUCH CAN BE REINVENTED AT ANY TIME."

Leland R. Kaiser.

Source: PubMed https://iii.hm/3b5

"Hospitals need new packaging, brand new dress that bespeaks health and happiness rather than sickness and suffering, hope instead of despair....What is being done to create for the patient surroundings that make him want to live, that restore to him the old fight to regain his health?"

Dorothy Draper

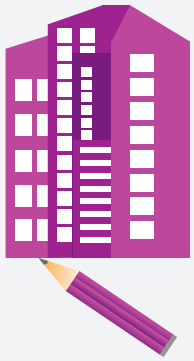
Source: African American Quotes https://iii.hm/3b6

MARCH 5

is National Industrial Design Day

Source: IDSA https://iii.hm/3ba

"How can we design a new generation of hospitals and outpatient facilities that eliminate waste, improve efficiency, promote safety for both patients and staff, streamline operations, reduce distractions that contribute to errors and provide for more adaptability over time?"



Charles Griffin

Source: The American Institute of Architects https://iii.hm/3b8

*"Since **60** to **75%** of hospital expenses are labour costs, a design that increases operational productivity or efficiency and reduces staffing needs can have a major impact on the bottom line."*

Robert F. Carr

Source: Whole Building Design Guide - Health Care Facilities https://iii.hm/3b7

75 %

of all deliveries in the hospital are done using eight automated guided vehicles (AGVs) to wheel about linens and supplies. A pneumatic tube system moves clean supplies, medicine and specimens through a network of 69 PTS stations using 288 carriers travelling at an average speed of 25 feet per second. Special pneumatic tubes are also used for waste removal and dirty linen.

Source: HOK - Humber River Hospital https://iii.hm/3b9

BEST DESIGNED HOSPITALS, 2015

1	***Gold Award:*** Memorial Sloan Kettering Cancer Centre, N.Y.
2	***Silver Award:*** St. Charles Cancer Centre Oregon
3	***Bronze Award:*** Prebys Cardiovascular Institute, California
4	***Senior Friendly Award:*** Centre for Advanced Care at Advocate Illinois Masonic Medical Center, Chicago

Source: Modern Healthcare https://iii.hm/3be

HOW COMICS PLAY A ROLE IN MEDICINE

Jorge Muniz is an internal medicine physician assistant, illustrator, and author of *Medcomic: The Most Entertaining Way to Study Medicine.*

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Tell us a little bit about your background. How did you get into illustrating and then connect that to medicine?
Although a career in the arts was something I thought about, when I started college I decided to study science. I obtained a Bachelor's degree in biology at George Mason University in Fairfax, Virginia. This eventually led me to pursue my Master's degree at Nova Southeastern University in Orlando, Florida to become a Physician Assistant (PA). Once I entered the world of medicine, I realised that I had finally found a theme to fuel my passion for cartooning. Even better, I was creating artwork that helped my colleagues learn medicine in a unique way.

What is the story behind *Medcomic?*
I've enjoyed drawing since I was a little kid. Some of my earliest memories are drawing sketches of clowns with my grandmother in Puerto Rico. In middle school and high school I was a bit of a technology nerd and played a lot of video games. By the time I was a freshman in college, my passion for art and technology led me to develop a strong interest in digital artwork. It was around that time that I decided I would publish some sort of online webcomic. I tried a few different ideas for a comic strip with my college roommates, but unfortunately they didn't stick.

The first official illustration for *Medcomic* was unlike the current educational cartoons I make. It began as a comic strip I drew when I was on a paediatric rotation in my second year of PA school. I was frustrated at how similar the names of certain diseases were, which made it harder to distinguish between them. I pictured a couple of evil doctors in an ancient castle, plotting against students by giving confusing names to newly-discovered diseases.

What has the response been to *Medcomic?* I understand medical schools are using it in courses.
The positive response has motivated me to continue the project and draw every day. Professors are currently incorporating the illustrations into their lectures and *Medcomic* books are being used as a fun way to supplement the curriculum.

Do you have any personal feedback from students?
Students send me topic requests every day and I try to keep track of the more popular requests for future artwork. I also get feedback from undergraduate students. One student wrote to me saying that they were writing a research paper for a freshman composition course and was considering writing about *Medcomic* and the potential of webcomics in higher education. It was very interesting to hear that sort of interest in the *Medcomic* concept.

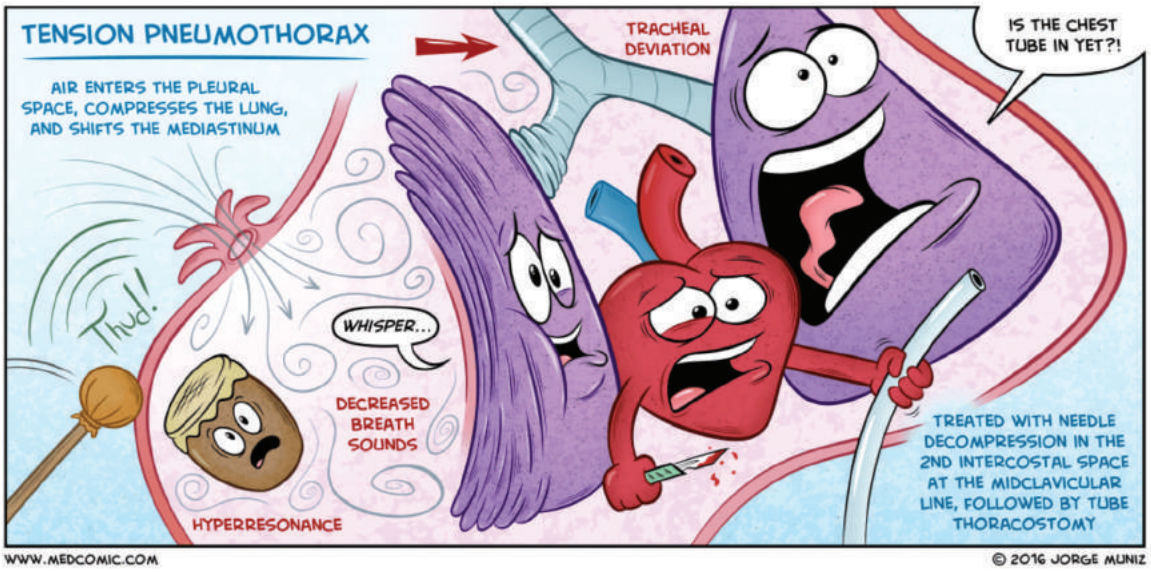
The illustrations really tell a story. Where do you get your ideas from and how do you tackle a drawing once you have decided on a subject?
After choosing a topic, I take a piece of paper, fold it in half, and start sketching the first thing that comes to my head. Once that rough sketch is made, I start working on the actual cartoon on my digital tablet. Usually what happens is that I think of an additional idea as I'm drawing and add it to the illustration. The cartoon tends to evolve as I draw based on how it starts to come to life on the canvas. The final illustration will usually look very different compared to the initial sketch.

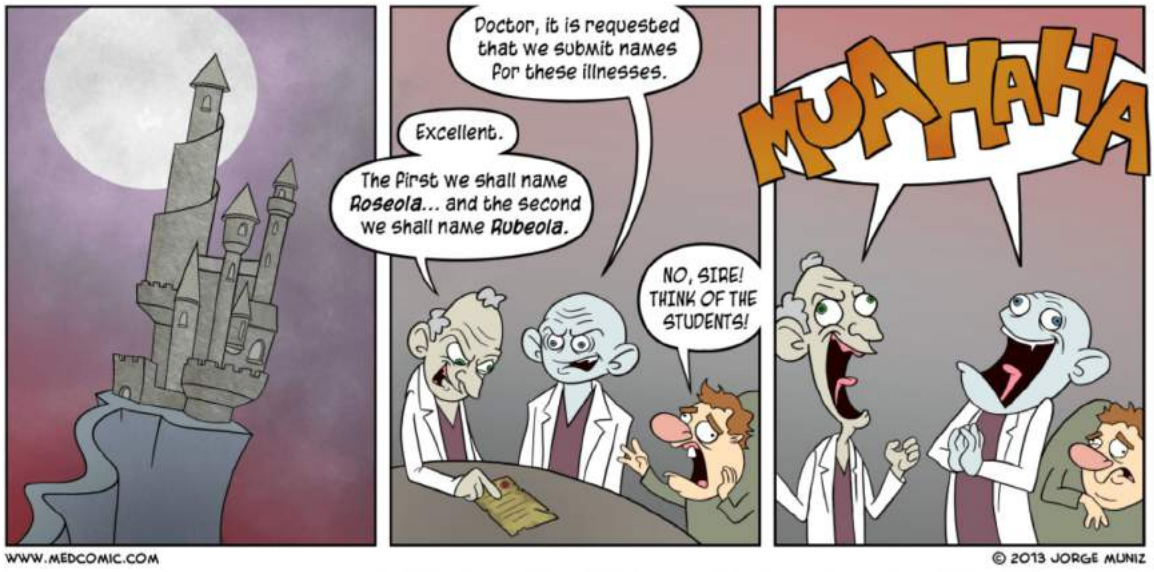
> "PROFESSORS ARE CURRENTLY INCORPORATING THE ILLUSTRATIONS INTO THEIR LECTURES AND *MEDCOMIC* BOOKS ARE BEING USED AS A FUN WAY TO SUPPLEMENT THE CURRICULUM"

Does *Medcomic* provide you with an outlet for the side of your personality that enjoys stand up comedy?
I'm a big fan of standup comedy and one of my favourite birthday gifts was when a group of my friends took me out to a local comedy club. It's a lot of fun. I like to think that every illustration has a little bit of my personality somewhere in there.

Do you have to tread carefully with combining humor and medicine? How do you do this?
It is important to me that each illustration serves the dual purpose of educating and entertaining. If the image is offensive or too crude I feel that it fails in one or both of those categories. A bit of shock value is good because the goal is for students to remember the drawing for their exams. In the end it can be difficult to maintain the balance because I am drawing cartoons about disease processes, but I try my best for the illustrations to be tasteful.

What is your connection to the medical field?
After obtaining my Master's in Medical Sciences and becoming a PA, I worked in the field of orthopaedic surgery at Florida Hospital, Orlando. As the PA on-call, my responsibilities included assessing and treating orthopaedic trauma





in the emergency department, performing reductions for fractures and dislocations, joint aspirations, and various other procedures. After two years in orthopaedics, I transitioned to treating patients in the field of internal medicine. I'm enjoying spending time with my patients explaining how we're going to treat their illnesses and educating them on how to make positive changes to their lifestyles.

How did the crowd funding campaign go for *Medcomic*?
The book, titled "*Medcomic: The Most Entertaining Way to Study Medicine*", was funded through Kickstarter and published in November 2015. It was a dream come true to be able to collect the artwork I had made up to that point and create an official volume. The Kickstarter was somewhat stressful to prepare for, but fortunately I had a lot of support and surpassed the funding goal within the 30-day window.

If there was something you could change about medical training, what would it be?
Students should be kept up to date with new trends in technology so that they're better prepared for the future of medicine. There could be more discussion on medical innovations going on with phone apps, diagnostic tools, and robotics that may not be found in traditional textbooks.

Right now your focus is on clinical matters. Do you ever think you'll prepare a textbook on healthcare management matters such as IT which is taking over and has a range of pros and cons?
There is certainly a lot of potential to grow the *Medcomic* concept in the future in new and interesting ways. The cartoons can be a vessel to provide commentary on key issues in healthcare such as IT. I'm also interested in creating materials for patient education. I'm excited to explore these possibilities in the future. I plan on continuing to produce artwork that brings a new perspective to important medical topics. The blog at Medcomic.com is a great platform for me to share new illustrations on a weekly basis. I'd like to eventually publish a second volume with comics from the blog and new cartoons made just for the book. ■

EUROPEAN INSTITUTE FOR INNOVATION THROUGH HEALTH DATA (i~HD)

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A new not-for-profit organisation, the European Institute for Innovation through Health Data (i~HD), held its inaugural conference and public launch in March this year in Paris.

This institute was formed in order to unite efforts to enable better uses of health data for the benefit of learning health systems and clinical research (The European Institute For Innovation Through Health Data, 2015). Healthcare organisations, health ministries and insurers, public health bodies, academic and industry sponsored research all recognise the potential opportunities to learn more from the growing volumes of health data collected in care settings and by patients themselves. The knowledge gained can be applied to optimise care pathways, improve the effectiveness and safety of the treatments given to individual patients, enrich our understanding of the safety of new treatments and help focus healthcare systems towards maximising outcomes most effectively.

However, there are a number of road-blocks that limit our capacity to integrate at scale, and to analyse, large volumes of routinely collected health information. The most significant of these are:

- Concerns to ensure the protection of patient privacy;
- Poor interoperability of health information held within multiple different electronic health record systems, disease registries, claims databases and other public health repositories;
- Weak incentives for busy clinicians to document high quality structured and coded health information;
- A generally limited understanding within society of why patients and the public should support better usage of their personal health information.

The projects, initiatives, standards and incentives making efforts to tackle these issues are relatively fragmented, poorly understood and not well adopted. i~HD is working to bring together the relevant experts and initiatives to consolidate and further advance the enabling solutions vitally needed to address each of these issues, and to widely promote their adoption, with the aim of scaling up our collective capability across Europe of making better uses of health data, to advance knowledge and enrich healthcare.

European Overview

The inaugural conference brought together over 200 such experts from across Europe, including health ministries, insurers, the pharma industry, healthcare providers, patient associations, health professional associations, the health ICT industry and standards bodies. Participants learned about why enabling better use of health data is a key target of the French Ministry of Health, which is keen to see greater value derived from national investments in ICT, and regards the reuse of clinical data for research as of strategic importance. The Executive Director of the Innovative Medicines Initiative (IMI) (Innovative Medicines Initiative, 2016), which is investing over 5 billion euros in public-private research projects, emphasised the ambition of improving the affordability and speed of access to innovations for patients. IMI projects are using electronic health records to speed up clinical trials and using Big Data to discover how to better target innovative therapies to the particular patients who will respond best to them. Its new Big Data for Better Outcomes programme will also work closely with health care stakeholders to help apply new evidence emerging from big data to improve healthcare systems. Participants also learned about Europe´s largest "big data" project in health: European Medical Information Framework (EMIF, funded by IMI).

A policy officer from the European Commission, DG CONNECT, emphasised the importance that the EC places on improving the interoperability of health data, and empowering citizens to play a greater role in their own health care and wellness (The Digital Single Market, 2015). The EC is investing, through its Horizon 2020 programme, in many initiatives to improve information connectivity across healthcare systems, to provide citizens with great assurances about the privacy protection and trustworthiness of personal health applications and devices, and to tackle the particular healthcare challenges of an ageing society (eHealth and Ageing, 2015). A former hospital CEO speaker explained why hospitals need to gain better value from the health data that they collect, and therefore to ensure the ICT systems that they procure are of a quality that can support the organisation to optimise its performance in delivering patient-centred care, maximising outcomes as well as business efficiently. The EuroRec Institute plays this leading role within Europe, assessing and certifying the quality of health ICT products such as EHR systems and clinical research platforms.

Innovative Directions

This inaugural conference also marked the parallel launch of a novel European platform to support multi-centre clinical research. This operational platform, called InSite, is the result of several European projects and connects securely to the data within multiple hospital EHR systems and clinical data warehouses across Europe, to enable a trial sponsor to predict the number of eligible patients for a candidate clinical trial protocol, to assess its feasibility and to locate the most relevant hospital sites.

The role of i~HD, as a not-for-profit Institute, is to provide independent governance oversight of such clinical research

platforms and services, as these expand to connect with multiple hospitals across Europe. Several presentations were given on this theme: the IMI-sponsored EHR4CR project (De Moor et al, 2015) and its pharma-led adoption programme, the new legal landscape protecting patient privacy, and the i~HD governance services that reflect state-of-the-art in the trustworthy reuse of health data for research. An expert on health information law explained the new European General Data Protection Regulation (Reform of EU data protection rules, 2015) and its potential implications for clinical research and the integration of Big Data.

> “THE ROLE OF I~HD IS TO PROVIDE INDEPENDENT GOVERNANCE OVERSIGHT OF CLINICAL RESEARCH PLATFORMS AND SERVICES, AS THESE EXPAND TO CONNECT WITH MULTIPLE HOSPITALS ACROSS EUROPE”

Also in the conference spotlight were the challenges and state-of-the-art approaches to improving the quality and semantic interoperability of clinical data, which was discussed within a panel comprising health ministry, health insurance, clinician and patient perspectives. The panel emphasised that interoperability is vital to ensure the coordination of care, especially because of increasing co-morbidity, with older generation patients having multiple long-term conditions and multiple treatments that can interact, potentially dangerously, unless care providers have the complete picture on their patients. There is a discord between the actors who use health ICT systems to record information, the actors who want to make use of that information, and those who invest in the ICT systems and thereby determine what is purchased, something that a new Horizon 2020 project VALUeHEALTH is investigating (The VALUeHEALTH Project, 2015). There was a consensus among the panellists that today's ICT systems demonstrate poor connectivity and poor patient orientation, and that many applications in use are not particularly friendly to the language and workflows of clinicians and patients. The panellists emphasised the importance of making better use of interoperability standards, and declared that the key actors to drive that adoption are the public authorities and health insurance. They also emphasised that there should be better cooperative design of ICT solutions with end users. The audience were informed that i~HD is playing a growing role in the development and quality labelling of interoperability specifications, bringing together clinical and research domain experts, with patients, to help ensure that future standards will support patient care, learning health systems and clinical research.

Patient Perspective

Two of the conference speakers specifically represented the views of patients and of society. Patients are increasingly involved in the collection of their own health data, for example through monitoring devices, but do not always have access to their own data. They must be much more involved in how their

Key Points

- ✓ A new European not-for-profit Institute, i~HD, has been launched to unite efforts to enable better uses of health data, for the benefit of learning health systems and clinical research.
- ✓ i~HD will help to establish and propagate best practices in the protection of patient privacy when health data are used for research and for population health analysis.
- ✓ It will work with standards development organisations, clinical and patient communities and with research sponsors in order to ensure that future interoperability standards optimally support patient care, learning health systems and clinical research needs.
- ✓ i~HD will connect with patient associations to help to promote patient access to health data, patient engagement in the creation and use of health data, and patient empowerment in decision-making.

health data are used to inform decision-making, and in those care and treatment decisions themselves. Society needs to be much more committed to promoting wellness and accelerating the discovery and testing of innovative treatments. Our ageing society is accumulating long-term conditions, and we need to be much more proactive in prevention and early detection. Health data are vital to improving our understanding of disease and the impact on the lives and wellbeing of patients. Society needs to better trust the security measures that can nowadays be applied to protect privacy, and to recognise the balance in proportionality between safeguarding health data and putting health data to good use.

i~HD will continue to work on the development of best practices to promote a trustworthy ecosystem for reusing health data for research, and the adoption of standards for high quality and interoperable health data. i~HD will be working with patient associations to understand their views on societally acceptable ways to scale up learning from health data, and how such learning can also ensure patient involvement and empowerment. ■

The conference was kindly hosted by the Assistance Publique - Hôpitaux de Paris & UPMC (Sorbonne Université) and organised by i~HD, EuroRec and RAMIT.

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IT Outsourcing: The View from the Top

Black Book Market Research recently released insightful figures on attitudes toward IT outsourcing in healthcare. To remain solvent and technologically advanced Black Book said hospital executives realise they need to "evaluate and leverage next generation information and financial systems as an outsourced service" (Black Book, 2015). The company found 73 percent of all surveyed hospitals and health systems over 300 beds were looking externally for technology solutions while 81 percent of provider organisations under 300 beds planned to prioritise complex IT outsourcing.

In terms of why outsourcing failed in the past, 606 former and current users of IT outsourcing solutions offered the following reasons – which can inform future decisions:

- Outsourced IT services that should have stayed within the organisation;
- Selected the incorrect vendor for the job;
- Neglected to realise the full costs of outsourcing;
- Permitted the outsourced service to get out of control;
- Disregarded employee and/or community concerns about outsourcing/offshoring;
- Wrote ineffective statements of work for the services outsourced;
- Failed to strategise an exit procedure before terminating the outsourcing contract;
- Unrealistic expectations;
- Lack of best practices for hospital IT outsourcing established;
- Did not monitor the performance of the contracted outsourcer. (Black Book, 2015).

The result is that going forward hospital executives are now intent on taking the business case for outsourcing into their own hands rather than leaving it to the vendor and ensuring that staff and outsourced services work well together is also of paramount concern.

HealthManagement.org spoke to hospital leaders and IT experts for their views on outsourcing.

"For achieving EMRAM Stage 7 we have some criteria that look at the use of Clinical Analytics and Business Intelligence (BI) within the hospital. Those criteria include things like the availability of an analytics strategy, the link of clinical activities to financial outcomes, examples of how BI has helped to improve clinical, organisational or financial performance. However, we do not systematically check if hospitals outsource these activities – meaning the data mining or storage part in it. With the rise of cloud-based solutions it may well be that also Big Data activities are going to be more and more outsourced, but it certainly depends on the definition of what part of Big Data activity, and also what outsourcing means in that context. For example is an EMR vendor who provides a web-based solution already "outsourcing?""

HIMSS Analytics

"The most important step in the process of outsourcing involves conducting thorough market research in order to choose the best organisation from among the key players in the region, but usually outsourcing in the healthcare sector is out of question. For example, Zulekha Hospital is accredited by Joint Commission International (JCI) and, among other healthcare governance standards we meet, JCI certification obliges us to make patients' confidentiality and safe data management our top priority. If a medical entity needs to outsource due to lack of internal resources, they must evaluate the risks involved beforehand and assess both flexibility and accessibility of tools being offered to medical professionals as well as other stakeholders. Every management strategy must aim to reduce costs, improve insights, and optimise growth, but never risk compromising patients' confidentiality."

Taher Shams, Managing Director, Zulekha Hospital, UAE

"We have outsourcing for some IT functions. In terms of Big Data or more specific data analysis in areas like pharmacy and quality indicators we have outsourcing that makes the analysis, compares the results with the benchmark and recommends some strategies. The benefits of outsourcing are based on sharing some expert resources with other companies. The decision about the vendor is complex because it depends on multiple factors."

Vicent Moncho, CIO of EMRAM Stage 7 hospital Marina Salud in Spain

"Today, we are not effectively using all already existing data for health and there is a lot we could learn from other fields where text and data-mining tools are in use and represent an important driver for innovation. Of course, applicable legislation on data protection must be observed."

Policy Officer Terje Peetso, DG Connect, European Commission on data security, a critical consideration in IT outsourcing

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CHALLENGES OF PREPARING STUDENTS FOR CAREERS IN THE NHS

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NHS Leadership Academy, UK

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England's National Health Service (NHS) is facing significant challenges in finding and retaining senior resource. The average tenure of a trust CEO is just 2.5 years and almost one third of all trusts have at least one vacancy or an interim executive board member. So it's safe to say the NHS isn't 'spoilt for choice' when filling senior vacancies.

Delivering the transformation set out in the Five-Year Forward View (NHS England, 2014) successfully will require outstanding leadership at every level to create and support sustainable change. In the long-term, the NHS Leadership Academy's Graduate Management Training Scheme (GMTS) aims to give top graduate talent the opportunity to work towards a successful leadership career in the NHS. But competition is fierce, with over 17, 500 candidates applying for 100 jobs last year.

The following are what we'd consider to be the key determining factors in preparing our graduates for their NHS career.

Diversity

Diversity is important because it's linked to creativity and, as a result, innovation. That's going to be so critical if we're going to think of new ways in which to achieve the radical, transformational shift needed to deliver a sustainable NHS across our local communities.

We're also keen to be seen to reflect the diversity of the people we 'work for' if you like i.e. patients. We look at this in two ways:

- The communities we go into to recruit our talent from: if we're on a campus, for example, is it appropriate that we're represented by a white middle-aged man? We want to give our students something aspirational; someone they can relate to and look up to who has joined the scheme and established a successful career, whose footsteps they feel they can follow in;
- The actual community our placements are offered in: it's a fact that the more representative senior leaders are of the people they're serving, the better the quality of care our patients receive. And the better the health outcomes. For GMTS though, it's about far more than ethics; these quality groups are under-utilised and we can play a real role now in ensuring future leaders from these groups are allowed to thrive in the system.

Diversity is more than ethnicity and gender; it needs to address issues around disability, age and social mobility. Our scheme isn't just made up of 21-year olds straight out of university. One of the ways that we ensure this is the case is through blind screening. Our assessors in interviews do not know the background of the candidate apart from their name. They don't know what school or what university they have gone to and we don't take into account anything around their education such as giving an extra point for UCAS points, the grading system. Neither do we favour any particular university or anything on those lines. We accept a 2:2 or equivalent, so we're quite open in that respect.

We also go to less obvious universities like the London Met and Coventry and to assessment centres in Leeds and Derby rather than just London.

> "DIVERSITY IS IMPORTANT BECAUSE IT'S LINKED TO CREATIVITY AND, AS A RESULT, INNOVATION"

Finally, our screening processes aren't just focused on the typical competency-based approach, which would typically favour people who have got a top place at university. We try and dig a bit deeper and adopt an approach that covers strengths and values.

Bridging the Gap Between Study and Work

It's all very well being perfect in the classroom, but you need to be able to translate that learning to operate under the stressful realities of the NHS workplace. For us it's all about experiential learning rather than the traditional 'talk and chalk' approach. We do provide the theory, models and concepts, but we also provide the opportunity to put that into practice in the workplace. And not just any workplace – the NHS workplace.

We work really closely with education providers, so even things like formal qualifications are still rooted in the realities of working in the NHS. An important part of how we base the decision on who is going to deliver the professional qualifications on the scheme is how they can relate it back to the NHS environment. That's really important for us.

Everything our students do is put into practice first in a safe environment then the graduate puts it into practice in the 'real world.' That's why we do things like different placements;

you wouldn't have the same richness of learning if you were in the same organisation for two years. We give graduates the opportunity to experience a full range of departmental settings.

It's also about being able to apply that knowledge in a way that's appropriate because one solution won't fix the whole of the NHS. It's got to be effective for your community, your particular organisation and your particular department. That's why we're keen to give that authentic experience, along with the tools and skills to handle it. We try and give as much preparation as possible around transferable skills and ability and awareness.

Finally, we're keen on testing the ability to self-reflect. Our graduates need to understand why they were successful or – just as importantly – unsuccessful, so they can repeat or adapt their approach to a range of situations.

Keeping the Quality of Work Placements Consistent

This can be a real challenge; but that's true for any graduate scheme. Not every trainee has the perfect placement but we try to be as flexible as possible and would look to make alternative arrangements for someone if we thought it was necessary.

The other challenge is around demand – there's such a huge demand from organisations for trainees and we can't possibly meet it.

The types of organisations that can bid for trainees has also become interesting; there are more commercial entities doing lots of NHS work, so the boundaries are blurring. Some of the less-typical organisations could probably bid because they could give a really good experience to a trainee. Then with the importance increasingly being placed on how social care interacts with health, it becomes even more diverse. The challenge for us is making sure we put people in the right placements; not just for now, but the next 10 to 15 years. Geography is a major factor; we need to put people right across the country and that can be challenging as well.

Some organisations are going through significant periods of stress at the moment. They would really benefit from having a trainee but some requests present a risk too. Can they give graduates the right level of care? Our aim is to consistently recruit outstanding people who share our values and want to help us ensure patients have a positive experience of the NHS.

About the NHS Leadership Academy

The NHS Leadership Academy was launched in April 2012. Its purpose is to develop outstanding leadership in health, in order to improve people's health and their experience of the NHS

The Academy brings together for the first time all the national activity supporting leadership development in health and NHS funded services.

The Academy's four key areas of work are:

- Developing and embedding a common vision for health leadership: researching, creating, developing, refining, sharing and embedding tools, evidence and examples setting out what good leadership and good leadership development looks like in a health care context;
- Leading the way in leadership development for a new health system: equipping leaders to meet the current and future challenges of the changing system;
- Supporting local leadership development: working with Local Delivery Partners to embed a nationally consistent, professional approach to leadership development while meeting local needs;
- Raising the profile, performance and impact of health care leaders: creating an environment in which leaders are required, and supported to, demonstrate proper readiness to fulfil their role. ■

Rob Farace Senior Programme Lead, NHS Leadership Academy

Rob Farace has worked in human resources for over twenty years and has specialised in resourcing, with a particular focus on graduate schemes. In his current role, he is responsible for recruitment to the NHS Leadership Programmes – including the award-winning NHS Management Graduate Scheme.

Rob started his career with the London Borough of Barnet before moving to the Children's Society and later to the Imperial Cancer Research Fund, where he set up their first ever graduate scheme. He played a key role in the biggest charity merger which formed Cancer Research UK, and went on to set up their resourcing function, introducing e-recruitment and several new graduate training schemes.

Rob sits on the Board of Directors for Charity Works – a unique Graduate Development Programme for the charity sector – and is a member of the CIPD Resourcing Steering Committee.

Key Points

- ✓ The need for diversity.
- ✓ The balance between theory and practice.
- ✓ Issues associated with work placements.

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EUROPEAN DIAGNOSTIC REFERENCE LEVELS FOR PAEDIATRIC IMAGING

AN UPDATE ON THE EC TENDER PROJECT PiDRL

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Despite a large number of studies available from European countries, the European DRLs for paediatric patients are only available for some common radiological examinations. There is a need to consolidate what is available and to provide guidance on what actions are needed in using DRLs to further enhance radiation protection of children. The European Commission (EC) recognised this need and approved a project on the establishment of European DRLs for paediatric patients in December 2013. The acronym of this project is PiDRL.

The PiDRL Project

This 27-month tender project was awarded to a consortium, which is headed by the European Society of Radiology (ESR). Other participating organisations include the key European stakeholders and professional groups relating to radiation protection of paediatric patients:

- European Society of Paediatric Radiology (ESPR);
- European Federation of Radiographer Societies (EFRS);
- European Federation of Organisations for Medical Physics (EFOMP);
- Finnish Radiation and Nuclear Safety Authority (STUK) with Public Research Centre Henri Tudor (CRP-HT) as subcontractor.

PiDRL is intended to provide European DRLs for the most frequent paediatric examinations and to promote their use so as to advance the optimisation of radiation protection of paediatric patients, with a focus on CT and interventional procedures using fluoroscopy.

The specific objectives of the project are to agree on a methodology for establishing and using DRLs for paediatric imaging and to update and extend the European paediatric DRLs.

To fulfill these objectives, this project especially relies on:

- The cooperation of the most relevant European umbrella organisations and their key experts in this field, supported by a radiation protection authority with wide experience on setting DRLs and radiation protection of paediatric patients, further supported by its sub-contractors of a paediatric hospital and an IT expert institute.
- A European Workshop to discuss and disseminate the results of the work packages, in particular the new insights gained, the needs for further action on DRLs and their use in the optimisation of radiation protection of paediatric patients.
- An Expert Advisory Panel made up by representatives of national and international organisations.
- Interaction with the Working Party on Medical Exposures of the Article 31 Group of Experts of the EURATOM Treaty during the project lifetime for feedback on the work performed.

The EuroSafe Imaging session on the Basic Safety Standards directive included representatives from the ESR, HERCA, EFOMP, EFRS and COCIR, including EuroSafe Imaging Steering Committee Chair Prof. Guy Frija (2nd left) and Prof John Damilakis (2nd right)

> "IN MANY COUNTRIES, INITIAL DRLS HAVE NEVER BEEN UPDATED"

The PiDRL project has very recently drafted European Guidelines on how to establish and how to use paediatric DRLs.

A comprehensive European and worldwide review of DRLs for paediatric examinations has indicated that only a few countries have set DRLs for paediatric examinations and there is a complete lack of national DRLs for many examinations, in particular for paediatric interventional fluoroscopically-guided procedures. Furthermore, the existing DRLs are often adopted from the old EC recommendations or from other countries, and only a few countries have based their DRLs on their own national patient dose surveys. In many countries, the initial DRLs have never been updated.

Conclusion

There is a need to establish DRLs for radiologic examinations and procedures where DRLs are not available and provide guidance on what actions are needed in using DRLs to further enhance radiation protection of children. PiDRL Guidelines provide an important tool for the establishment and use of paediatric DRLs for x-ray procedures. These guidelines cover a wide spectrum of modalities including radiography, computed tomography and fluoroscopy. Based on the critical review of all paediatric national DRLs set by authoritative bodies in the European countries, European DRLs have been suggested for radiography, fluoroscopy and CT. The PiDRL project has also performed two limited surveys on cardiac fluoroscopically-guided procedures and non-cardiac fluoroscopically-guided procedures. ■

PiDRL EUROPEAN DIAGNOSTIC REFERENCE LEVELS FOR PAEDIATRIC IMAGING

Key Points

- ✓ There is a need to provide guidance on what actions are needed in using DRLs to further enhance radiation protection of children.
- ✓ PiDRL aims to promote DRLs to optimise radiation protection of paediatric patients, with a focus on CT and interventional procedures using fluoroscopy.
- ✓ Existing DRLs are often adopted from the old EC recommendations and very few countries have based their DRLs on their own national patient dose surveys.

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ESR Eurosafe Imaging – PiDRL Project European diagnostic reference levels for paediatric imaging http://www.eurosafeimaging.org/wp/wp-content/uploads/2014/08/PiDRL-Project.pdf

CT DIAGNOSIS OF SUSPECTED ACUTE AORTIC SYNDROME

PROTOCOLS FOR TIMELY AND ACCURATE ASSESSMENT

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Acute aortic syndrome (AAS) is a life-threatening condition which requires urgent and immediate treatment. AAS can be diagnosed by using computed tomography (CT) imaging, but it is important that key protocols are followed in order to optimise scanning parameters. These recommendations, published by the *British Journal of Radiology,* provide vital guidance to make full use of recent advances in CT technology to rapidly and accurately diagnose this dangerous condition.

Important principles are identified for motion-free imaging of the aorta with particular emphasis on the use of ECG-gating techniques. The paper outlines how each imaging centre can optimise protocols for accurate diagnosis, optimise radiation dose and reduce the risk of false-positives.

First author, Dr Varut Vardhanabhuti, said, "These recommendations are the first of their kind in the UK and will ensure consistent high performance imaging in these patients".

Dr Stephen Harden, one of the authors and Past President of the British Society of Cardiovascular Imaging (BSCI) and The British Society of Cardiovascular CT (BSCCT), said. "We are delighted to have worked with the BIR to produce this vital publication".

Dr David Wilson, President of the British Institute of Radiology, said, "This is an invaluable resource for radiology teams. It has been a privilege to work with the BSCI and the BSCCT to publish this work which will inevitably enable rapid and accurate diagnosis for people with this dangerous condition".

Below are some key excerpts from the paper:

Definitions of AAS

"Timely and accurate assessment of suspected AAS is vital in this potentially life-threatening condition with significant pre-hospital and in-hospital mortality rates of up to 20 percent and 30 percent, respectively. There are many definitions of AAS; however, for the purpose of this document, AAS is defined as aortic dissection, intramural haematoma and the complications arising from penetrating atherosclerotic aortic ulcer. These are not mutually exclusive and may represent variations on the same disease spectrum. Different classifications of aortic dissection exist, but to avoid confusion, we recommend using the most recently proposed classification of defining dissection as follows: Type A, involving the ascending aorta; Type B, limited to aorta portion distal to left subclavian artery; and Type B with aortic arch involvement, involving the arch (between the innominate and left subclavian arteries) but not involving the ascending aorta. The classification reflects the current management approach, which supports that Type B dissection can be managed conservatively. With recent advances in CT scanning technology and increasing expertise in cardiovascular CT, the purpose of these recommendations are to outline the best practice for the investigation of suspected AAS so that unequivocal diagnosis can be made based on imaging. Specifically, accurate motion-free imaging is vital to eliminate the possibility of false-positive diagnoses, needless patient transfer and potentially disastrous unnecessary surgery, all of which have been reported."

Assessment of Pre-Test Likelihood

Recommendation 1

"Assessment of pre-test clinical probability of AAS should be performed using American College of Cardiology Foundation (ACCF)/American Heart Association (AHA) guidance.

Initial evaluation of AAS should be based upon careful history and clinical examination (i.e. assessing for peripheral pulse deficits and potential end organ damage secondary to dissection) resulting in the ability to determine a pre-test likelihood of AAS. A summary of pre-test likelihood is shown in **Figure 1** which categorises patients into low, intermediate or high likelihood of AAS.

Recommendation 2

"Patients deemed to have intermediate or high risk should proceed to have imaging to establish a definitive diagnosis. In patients with low clinical risk, an alternative diagnosis should be considered but definitive imaging may also be required."

Imaging Modality and Technique

Recommendation 3

"Imaging Modality And Technique When imaging is deemed appropriate, CT scan is the imaging modality of choice in an acute scenario."

Recommendation 4

"All CT scans should be performed with the aim of producing motion-free images of the aortic root, which is prone to pulsation artefact (**Figure 2**)."

Recommendation 5

"A non-contrast ECG synchronisation CT scan should be performed to look for a rim of hyper-attenuation around the aortic wall (**Figure 3**)."

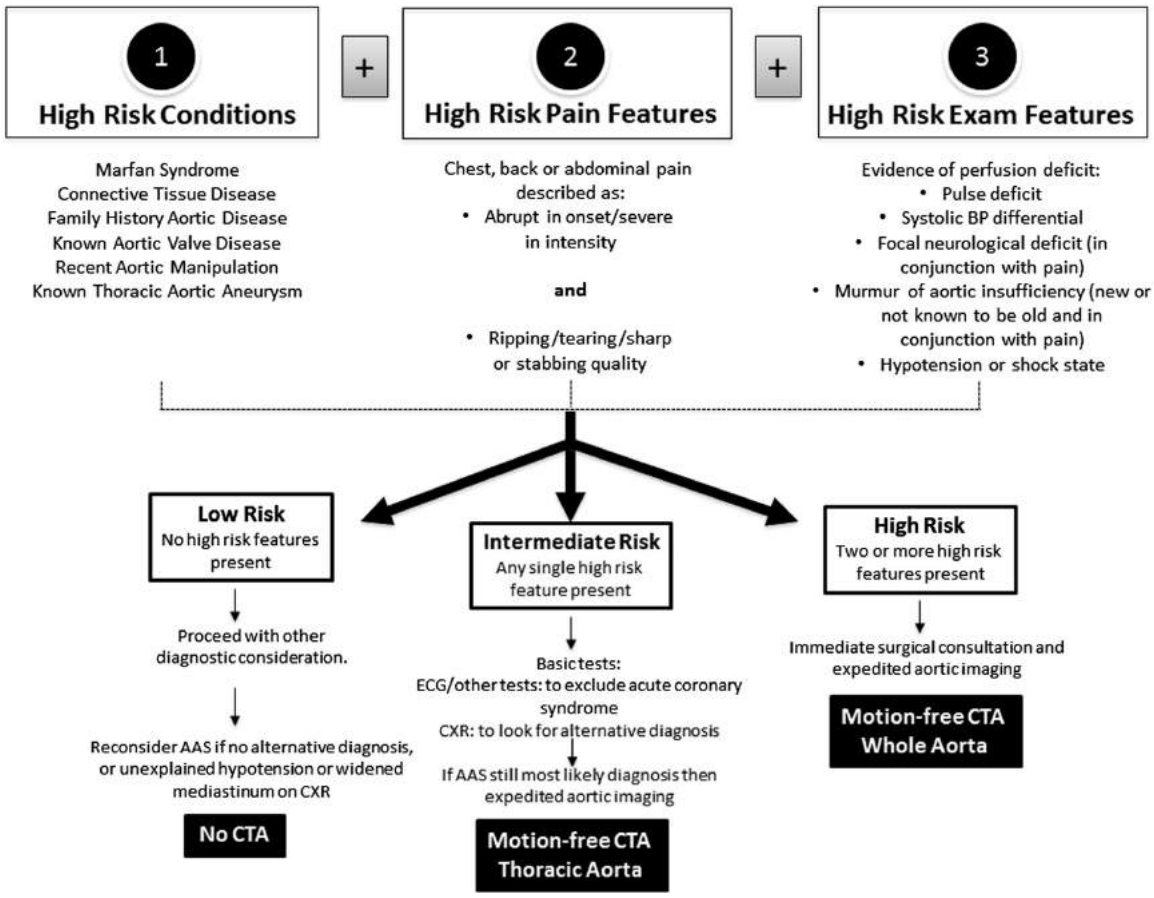

Figure 1. Risk stratification for acute aortic syndrome and appropriate management strategy.

Coverage

Recommendation 6

"Coverage should be limited to thorax from aortic arch to diaphragmatic sulcus in the first instance, unless the patient is deemed high risk or has known disease."

Scan Initiation and Contrast Regime

Recommendation 7

"A dedicated injection protocol should be used, taking into account the speed of scan acquisition and coverage with the aim to achieve adequate contrast concentration of at least 250 HU in the aorta.

There are three distinct methods of scan initiation that may be used.

Fixed delay, Test bolus, and, Bolus tracking."

Recommendation 8

"The key to adequate contrast opacification is to achieve an iodine delivery rate of at least 1.6 g s-1 (ideally up to 2 g s-1) when using a tube voltage of 120 kVp."

Optimising CT Parameters

"Although diagnosis of AAS can be made using non-gated CT techniques, image quality at the aortic root is often suboptimal owing to motion artefact. This limits the diagnostic confidence and may on occasion mimic aortic dissection, leading to unnecessary further investigation and treatment, including sternotomy/ thoracotomy. The prevalence of aortic motion artefacts with non-gated CT has been reported to be high as 57–93 percent in some series. With ECG synchronisation, the occurrence of this artefact is less common, allowing motion-free visualisation of the aortic root and proximal coronary arteries in almost all cases.

To allow for prospective acquisition of the aorta, systems with detector coverage of at least 32 mm in the z-axis are recommended to make breath-holding possible during the whole scan acquisition. ECG synchronisation must be available to allow co-registration with heart rhythm. Scanners with ≥64 detector rows should be used in conjunction with narrow reconstructed slice thickness (<1 mm) in order to provide adequate multiplanar reformats, preferably with isotropic resolution utilising small voxel size through the use of a small field of view tailored to the aorta.."

Specific Protocol Examples

"For each scanner type, it is important that dedicated protocols are used and optimised. These protocols outlined below should be used as a guide, and variations may exist depending

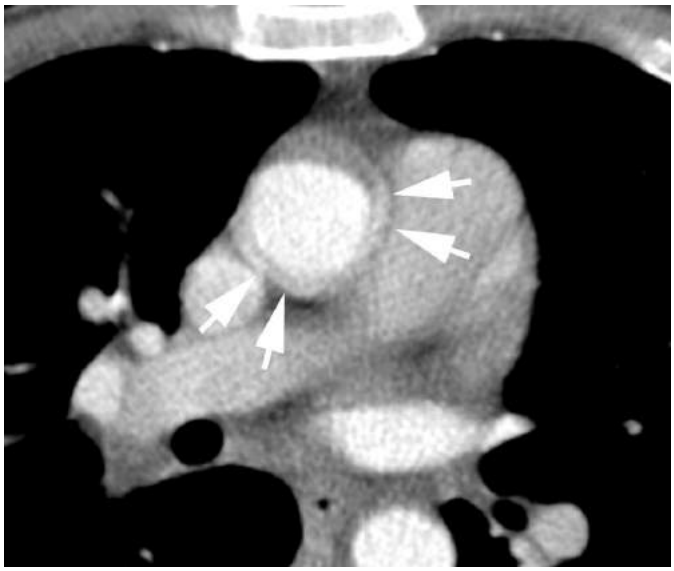

Figure 2. Ungated CT angiogram of the aorta demonstrating pulsation artefact (arrows).

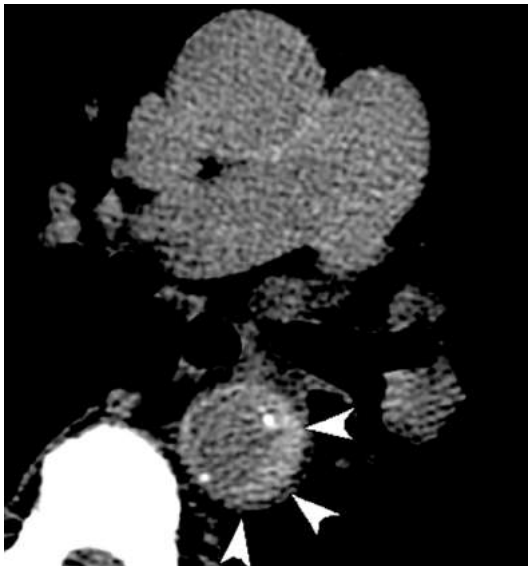

Figure 3. Non-contrast CT demonstrating typical appearance of a hyperattenuating crescentic ring that can be seen in acute intramural haematoma (arrowheads).

on differing parameters as outlined above. These protocols are advocated based upon expert BSCI user recommendations and in collaboration with UK application specialists."

Basic Concept

"For a 64-detector-row system (including "128-slice" scanners and similar), prospective ("step-and-shoot") acquisition should be employed where possible with phase selection based on HR. This is because the phase with minimal motion of the aortic root varies with HR. At HR <65 beats per minute (bpm), this is usually the end-diastolic phase. With HR >65 bpm, this is usually end-systolic phase. Where phase selection is not adjustable (e.g. on a scanner with prospective helical acquisition with diastolic phase acquisition only for slow HRs), then a retrospective protocol may need to be employed for patients with faster HRs. Retrospectively gated acquisitions can be used but should be only employed where no prospectively triggering alternative exists. Iterative reconstruction algorithms should be used where deemed appropriate to allow reduced radiation dose. For larger detector array or high-pitch dual-source systems, ECG synchronisation may not be necessary for motion-free imaging of the aorta."

Conclusion

"With continuing rapid advancement of CT technologies and the need to standardise image acquisition coupled with an obligation for dose optimisation, these recommendations should allow centres to adopt protocols specific to their scanners for timely and accurate assessment using the basic principles outlined in this document. Acquisition is only one aspect of the scan and to properly implement this imaging strategy, centres must also adopt appropriate reporting facilities (e.g. picture archiving and communication system must be able to manage ECG-gating data sets, including handling of multiphasic reconstruction of retrospective acquisition), radiographer's training, as well as reporting expertise.

In terms of implementation, it has been shown that application of ECG gating by adequately trained staff has no impact on the workflow of the CT examination in acute setting.

Definitive diagnosis of ascending aortic pathology, eliminating false-positive scans, should become routine practice and no patient should undergo sternotomy/ thoracotomy or other intervention without an optimal AAS CT scan." ■

Source:

The British Institute of Radiology (BIR)

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For full supporting references please see original article.
http://www.birpublications.org/doi/10.1259/bjr.20150705

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ESGAR CONSENSUS STATEMENT ON LIVER MR IMAGING

CLINICAL USE OF LIVER-SPECIFIC CONTRAST AGENTS

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The European Society of Gastrointestinal and Abdominal Radiology (ESGAR) formed a multinational European panel of experts, selected on the basis of a literature review and their leadership in the field of liver magnetic resonance (MR) imaging, to develop a consensus and provide updated recommendations on liver MR imaging and the clinical use of liver-specific contrast agents.

The consensus provided updated recommendations on the methodology, and clinical indications, of MRI with liver specific contrast agents in the study of liver diseases.

Methodology

A modified Delphi process was adopted to draft a list of statements. Descriptive and Cronbach's statistics were used to rate levels of agreement and internal reliability of the consensus. Three Delphi rounds were conducted and 76 statements composed on MR technique (n = 17), clinical application of liver-specific contrast agents in benign, focal liver lesions (n = 7), malignant liver lesions in non-cirrhotic (n = 9) and in cirrhotic patients (n = 18), diffuse and vascular liver diseases (n = 12), and bile ducts (n = 13). The overall mean score of agreement was 4.84 (SD ±0.17). Full consensus was reached in 22 percent of all statements in all working groups, with no full consensus reached on diffuse and vascular diseases.

Background

The advantages of MR imaging in the investigation of the liver are well documented since this examination provides a comprehensive work-up of focal and diffuse liver diseases. Recent state-of-the-art techniques including fast scanning acquisitions and new MR imaging contrast agents enable improvements in detection and characterisation of focal liver lesions. Therefore, together with appropriate clinical information, in most cases, a definitive diagnosis can be adequately achieved avoiding invasive procedures such as liver biopsy. This is based on the unique properties of MR imaging resulting in a high intrinsic soft tissue contrast between normal liver parenchyma and liver lesions, which can be further enhanced with intravenous administration of non-specific (extracellular) and liver-specific (hepatobiliary) gadolinium-based contrast agents.

Multiphasic dynamic gadolinium-enhanced imaging, which is considered essential in detection and characterisation of liver lesions, is routinely obtained by using non-specific intravenous contrast agents that distribute in the extracellular space, both within and outside the vessels, and have imaging dynamics comparable to the extracellular iodinated contrast media used in CT.

The so-called liver-specific (or hepatobiliary) contrast agents (gadobenate dimeglumine, Gd-BOPTA, and gadoxetic acid, Gd-EOB-DTPA), are characterised by a dual behaviour: by exhibiting elimination through both renal and hepatic excretion pathways and thereby possessing both early perfusion information (renal elimination pathway) and, later, hepatocyte-selective information (hepatic excretion pathway) mediated through protein transporters, located in the canalicular or sinusoidal pole of the hepatocytes.

The liver-specific contrast agents are Gd-based compounds and, therefore, shorten the T1 relaxation time that results in an increased signal intensity of the healthy liver parenchyma on T1-weighted images.

Discussion

Along the entire consensus process, the panel of experts completed three rounds; the first served to elaborate the basic statements, whereas the second and third rounds contained the core of the discussion and were necessary to reach the maximum consensus, in order to create an optimised and homogeneous opinion for each statement. Finally, the overall mean score of the panellists was 4.84 (SD ±0.17), which should be considered an almost excellent result of agreement. A mean score of 4 was considered a good agreement between panellists and a score of 5 a complete agreement.

All panellists exhibited a high level of agreement for the MR technique with clear recommendations regarding the use of MR coils, type of contrast agent, and the specific MR sequences to be used in liver MR examinations. These data reflect a consolidated approach to liver MR examination with no significant difference among panel members despite their wide geographical spread.

As a basic rule of MR technique, all the panellists clearly addressed that the workup of solid focal liver lesions should include axial T2- and T1-weighted sequences, followed by T1-weighted gradient dual echo images, DWI (using low and high b-values) and dynamic contrast-enhanced T1-weighted fat-saturated. However, no full consensus was reached on statements that addressed similar results of MR imaging at 3 and 1.5 T. This incomplete agreement can be explained

by the discrepancies of the comparative studies on the use of 1.5 vs. 3 T MRI.

The remaining statements regarding MRI technique, even with less than "full" consensus, definitively addressed the modalities of contrast medium administration (flow-rate of 1–2 mL/s followed by a 20-mL saline flush at 1–2 mL/s using a bolus triggering technique) and timing of T2-weighted and DWI sequences (after the acquisition of the contrast-enhanced late dynamic phase).

With regards to the recommendations on the use of Gd-BOPTA and Gd-EOB-DTPA that are currently available on the market, the panel was aware there are no data indicating diagnostic superiority of one agent over the other.

All panellists fully agreed that all non-blood pool gadolinium chelate-based contrast agents are suitable for dynamic liver MRI, but the use of liver-specific contrast agents is mandatory to obtain the hepatobiliary phase in addition to the dynamic phase.

A mean good level of agreement was reached between the panellists regarding the application of liver-specific contrast agents in benign hepatocellular liver lesions, and addressed MRI as the preferred imaging modality for the characterisation of equivocal focal lesions detected by other imaging modalities. Grazioli et al, through a quantitative analysis of signal intensity, lesion-to-liver contrast, and enhancement ratio, demonstrated that Gadoxetic acid-enhanced MR imaging facilitates the differential diagnosis of hepatocellular adenoma (HCA) and focal nodular hyperplasia (FNH). The same author showed in a previous article that this was possible with Gd-BOPTA.

A mean good level of agreement was also reached on the cluster of statements about malignant liver lesions in non-cirrhotic patients, where the use of liver-specific contrast agents has been recommended to improve the differential diagnosis between a solid benign hepatocellular lesion and metastasis, and delineation of primary liver tumours (including intrahepatic or mass-forming cholangiocarcinoma).

With regard to mass-forming cholangiocarcinoma, the panel clearly stated that concerning the delayed phase enhancement obtained with non-specific extracellular agents, Gd-EOB provides a relative hypointense MRI pattern of the lesion both in the transitional and hepatobiliary phases that improves tumour conspicuity. The panel suggested also the use of DWI and perfusions techniques, and recently, Park et al demonstrated that the target appearance seen on the DWI was the most reliable imaging feature for distinguishing small mass-forming peripheral cholangiocarcinoma from small hepatocellular carcinoma (HCC).

The best agreement among the panellists was reached for focal liver lesions in cirrhotic patients. The panel stated with full agreement that a confident diagnosis of HCC by using a complete dynamic study with pre-contrast and multiphase sequences can be optimally reached with a late hepatic arterial phase over early arterial phase, and the hepatobiliary phase may be delayed depending on a reduced liver function.

Of note, the panellists addressed that the use of liver-specific contrast agents has particular usefulness in improving the detection of HCC.

In summary, the panel suggests that in cirrhotic patients, the hepatic arterial phase and portal venous phase might not be sufficient to establish a confident diagnosis of HCC and should be integrated by the hepatobiliary phase.

No statement reached full agreement for diffuse and vascular liver diseases, and it was acknowledged that a correct estimate of the degree of steatosis and iron overload needs multiparametric MRI, even if the administration of contrast agents may alter the quantification of fat and iron liver content.

The final cluster of statements indicates that the evaluation of the biliary tract should be an integrant part of the liver study, and MRCP should be performed on pre-contrast series with heavily 2D and/or 3D T2-weighted sequences.

In the absence of liver function impairment/biliary obstruction, contrast-enhanced MR cholangiography (MRC) can be optimally obtained with Gd-EOB-DTPA at 20 min after injection. Hepatic excretion of liver-specific contrast agents results in enhancement of biliary structures, and it is likely to have a great impact on better visualisation of biliary system.

On the basis of these characteristics, it may potentially increase reliability of the MR examination or decrease the occurrence of a non-diagnostic or equivocal interpretation. This emerging diagnostic tool, especially when using Gd-EOB-DTPA, is particularly helpful for delineating the anatomy of the biliary tract and detecting post-operative complications such as anastomotic and non-anastomotic strictures and biliary leaks. In addition, it can provide functional information that is extremely promising in the grading of biliary obstruction. The drawbacks of contrast-enhanced MRC include its high cost (it is also a time-consuming technique) and limitations in depicting the biliary system in patients with hepatobiliary dysfunction. ■

Key Points

- ✓ Liver-specific contrast agents are recommended in MRI of the liver.
- ✓ The hepatobiliary phase improves the detection and characterisation of hepatocellular lesions.
- ✓ Liver-specific contrast agents can improve the detection of HCC.

REFERENCE

Neri E, Bali MA, Ba-Ssalamah A et al. (2016) ESGAR consensus statement on liver MR imaging and clinical use of liver-specific contrast agents. Eur Radiol, 26(4): 921–31.

FATAL FLAW IN BREAST CANCER SCREENING

IMPACT OF DENSE BREAST TISSUE ON RELIABILITY OF MAMMOGRAMS

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The internet and social media have transformed our lives. They have literally opened up a global connection to those with similar interests and passions. In my focused world of patient advocacy for breast health, I meet innumerable women, fervent in their yearly breast cancer screening, yet diagnosed with a missed, delayed and advanced stage cancer because of their dense breast tissue. Like me, these women never knew about the impact of dense breast tissue on the reliability of their mammogram until after their diagnosis. Our mission is to correct this fatal flaw in breast cancer screening.

Through a quick internet search for information about dense breast tissue, these 'strangers' quickly become my fast friends. I often kid that **AreYouDense.org** and **AreYouDenseAdvocacy.org**, the websites of our two nonprofit organisations, are akin to an online-dating service, uniting me with breast cancer patients, stunned by their later-stage cancers, in spite of never missing a mammography appointment. These encounters lead to a relationship cultivated by emails, texts and online messaging.

Through Facebook, I remotely get introduced to their kids, grandkids and pets, often commenting on their family's memorable moments and encouraging them as they progress with their breast cancer treatment. As with online dating, at times we advance the relationship by communicating by phone and on several occasions meet in person. These women become my extended family. Relationships, which were birthed based on our common bond of breast cancer, develop into a heartfelt friendship.

Bumpy Road of Patient Advocacy and Breast Health

Upon my advanced stage cancer diagnosis in 2004, after never missing an annual mammography appointment, I asked my 'team' of doctors as to why my 11 years of normal mammograms did not find my cancer. I was stunned by each of their responses that my dense breast tissue, which I was unaware of, masked my cancer for years and that mammograms are limited in finding cancers in dense breasts. The non-nonchalant responses from my health care team and their refusal to disclose this 'dense' information to their patients as part of their mammography report, led me to travel the bumpy and unpaved road of patient advocacy and breast health. A decade of research existed at the time of my diagnosis on the limitations of mammograms in women with dense breast tissue and more than two decades of research on the causal risk of dense breast tissue.

My desire was to expose the secret of dense breast tissue, taking this information from the scientific journals to the examining room.

The Immense Reach of Social Media

Social media have brought together a community of breast health advocates, breast cancer survivors, and healthcare providers, to communicate about the many aspects of breast cancer such as prevention, risks, screening, treatments, and promising research for a cure. Open 24 hours, within seconds of breast cancer survivors' posts about side effects from

> "I WAS STUNNED (TO HEAR) THAT MY DENSE BREAST TISSUE, WHICH I WAS UNAWARE OF, MASKED MY CANCER FOR YEARS"

treatment, decisions about surgery and their most intimate anxieties and fears, the cheer-leading team of survivors, caregivers, and health care providers intervene. My advocacy work and our immense reach through social media, give me the opportunity to console a sister or brother, to offer hope to them and their families as they 'live' with a breast cancer diagnosis.

In the United States, breast cancer is the second leading cause of cancer deaths in women and the leading cause of premature mortality. Whether from my local community support group or through the infinite bond of social media, I have experienced much gratitude hanging out with my breast cancer friends. Not thankful for our diagnosis, but because of the fragility of cancer, we have a heightened gratitude for each day. Too many of us can check all the boxes for the prevention measures we adhered to - no smoking, maintaining a healthy weight and diet, being physically active and never missing our yearly mammography screening. Consequently, I experience grief all too often.

My global connections with friends with a breast cancer diagnosis, connect me with women whose cancer had metastasised upon diagnosis. Their deaths hit hard. Like the death of President Kennedy when I was in grammar school, I can recall the exact time and place when I received notice about one of my friends' passing.

Often the notices are through social media. Having experienced more deaths than I am prepared for, I often think of our first-responders and hospice health-care providers, where death becomes commonplace and wonder how they cope with their frequent grief.

The lives and deaths of my extended newfound family motivate me as I advocate for our mission to eliminate grief of a loved one dying prematurely from this disease. The complexity of breast cancer biology tells us that even with an early diagnosis, the disease can progress and kill. However, research also concludes that early detection still matters. Tumour size and nodal status still have a significant and major influence, independent of tumour biology, in the current era of more conservative surgery and more effective systemic adjuvant therapies.

Advocating for Density Reporting and Education

While my heart and soul grieve the death of friends from breast cancer, it also motivates me to continue to advocate for density reporting and education and access to multimodal screening to reduce advanced disease and premature death from breast cancer. ■

Follow Nancy M. Cappello, Ph.D. on Twitter: **www.twitter.com/DrNancyCappello**

Key Points

- ✓ Mammograms are limited in finding cancers in dense breasts.
- ✓ In the U.S., breast cancer is the second leading cause of cancer deaths in women.

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Further Information

Are You Dense – Patient Stories: **http://www.areyoudense.org/stories/**

Exposing the best-kept secret: **http://www.areyoudense.org/files/1814/5236/2405/JAN_11_2016.two_page_brochure.pdf**

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Breast Cancer Screening for Women at Average Risk - 2015 Guideline Update From the American Cancer Society (Journal of the American Medical Association) **http://jama.jamanetwork.com/article.aspx?articleid=2463262**

Insights from the Breast Cancer Screening Trials: How Screening Affects the Natural History of Breast Cancer and Implications for Evaluating Service Screening Programs (The Breast Journal) **https://www.researchgate.net/publication/268527874_Insights_from_the_Breast_Cancer_Screening_Trials_How_Screening_Affects_the_Natural_History_of_Breast_Cancer_and_Implications_for_Evaluating_Service_Screening_Programs**

PROSTATE SELF-CARE AND AWARENESS

MEN LAG BEHIND

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In an ideal world, there is no answer to the common question of what we would recommend men of all ages to do or change in their lifestyles to reduce the prospects of prostate cancer. Unfortunately, we don't know what causes prostate cancer, but what we do know is that a healthy lifestyle (equilibrated food and healthy exercise) is beneficial for many conditions.

If one advice should be retained it is to stop smoking because we know smoking is one of the causes of bladder cancer and could have an influence on other urogenital cancers. So, it is better to be safe than sorry.

Patient Safety Concerns

As patient safety concerns are no different in treating prostate cancer in comparison to other cancers, there are no specific safety rules. However, the positioning of the prostate requires special attention so as not to bring harm to delicate tissues around the organ. For radiation treatment for metastasis, the position (bone, lung, brain, etc.) requires adapted safeguards.

Prostate screening is only done in a few countries, as in most countries it is up to the patient to ask for a prostate-specific antigen (PSA) test, which is the most used blood test to detect "problems" in the prostate. What we do see today is that more patients with low-risk prostate cancer are taken care of with active surveillance as the initial treatment. For patients, this can then become the only treatment they will ever have for their prostate cancer.

> "IF ONE ADVICE SHOULD BE RETAINED, IT IS TO STOP SMOKING"

As a patient organisation and active in advocacy, we are in constant contact with all stakeholders and we try to be present wherever this could be beneficial for our fellow patients. This can be at the level of the European Medicines Agency (EMA), the guidelines committees at European level (EAU) or in the member states. In our contacts with the industry and clinicians, we always want to know what is coming up for the patients, because their future is our first concern.

Europa Donna vs Europa Uomo

I am often asked, "can we compare Europa Donna and Europa Uomo, or is it like comparing apples and oranges?"

In fact, we can compare, but Europa Donna has a long-standing tradition of patient involvement and advocacy, whereas Europa Uomo is still learning and improving on these. So, our achievements are growing...

When it comes to self-care and awareness about prostate, men are known to be lagging behind and that is not because we only started late, but because most men are ignorant on health issues and accept that their partner, wife or mother takes care of them. We have work to do to motivate them to become aware that their health is their own responsibility and that it should not depend on someone else's pushes.

Despite growing numbers of male bladder cancer or other urogenital cancers, at present, Europa Uomo is only about prostate cancer, that is how it was founded 12 years ago. The potential of extending our interest into other male conditions (cancer) has not been expressed and needs to be seen.

Wrong to Put Age Limit for Screening

As regards the timing or age for screening, it would be wrong to choose an age to start with the screening for any illness. There could be an ideal age to start, but this should be according to the specific disease. And, screening for a disease is only one step in a diagnostic path, as there should be enough evidence for all the steps in that path. We should, in the end, diagnose men with curative diseases in such a stage that they can be offered a curative treatment.

In recent developments, the influx of migrants from refugees from lower-healthcare countries (North Africa, Middle East, central Asia) has created a strain for the medical profession, as well as the patient services and organisations. It also certainly adds new strains on our healthcare systems and new challenges as well. We have seen the appearance of new diseases, or the recurrence of old diseases that we did not see before, but only rarely, and the financial burden on health systems has increased.

On the same issue, it is difficult to identify qualified urologists from among the "wave" of migrants and refugees that could be better utilised to help overcome the language or cultural barrier. But, as we constantly have doctors from all over the world in training here, even as urologists, we may find adequate help there. It will always be a problem to allow doctors trained in a far away country, in a language not spoken in our country and under a different healthcare system, into our own healthcare system without proper (re)training. ■

Key links:
europa-uomo.org

PROSTATE CANCER DIAGNOSIS AND MANAGEMENT

CLINICAL TRIAL TO TEST IF MRI CAN REPLACE CURRENT STANDARD OF CARE

A team of scientists in Canada has secured funding for a three-year Phase III clinical trial focused on improving the way we biopsy for prostate cancer and whether magnetic resonance imaging (MRI) can replace the current standard of care to diagnose prostate cancer.

The PrECISE project to construct computational models to improve prostate cancer treatment, has secured $3 million in funding from the Movember Foundation, the Ontario Institute for Cancer Research (OICR) and Prostate Cancer Canada to determine whether MRI imaging can spare some men from undergoing a biopsy and avoid the possible associated side effects.

Leading the project is Dr. Laurence Klotz of the Sunnybrook Research Institute in Toronto, the man who is credited with coining the term 'active surveillance', a standard practice to monitor patients with low risk prostate cancer. Dr. Klotz, a world leader in the field of prostate cancer research, is also

> "THIS TRIAL WOULD SUPPORT A CHANGE IN PRACTICE FROM RELYING ON BIOPSIES FOR ALL MEN WITH SUSPECTED PROSTATE CANCER TO PROVIDING MRI FIRST WITH SELECTIVE TARGETED BIOPSY"

a professor at the University of Toronto and the Chair of the World Urologic Oncology Federation.

MRI technology is a precise tool that could better identify which patients should undergo biopsy, and enable targeted biopsy of only areas suspected of malignancy.

TRUS-Guided Biopsy Not Sensitive Enough

Currently, prostate cancer is diagnosed by trans-rectal ultrasound (TRUS)-guided biopsy of the prostate, in most cases following a Prostate Specific Antigen (PSA) test.

This form of biopsy carries potential side effects such as infection and bleeding because it is not targeted, and requires as many as 10 or 12 biopsy samples to establish an accurate reading. In addition, this current standard of care is not sensitive enough to discriminate between high-risk and very low-risk changes in prostate tissue, resulting in the over-diagnosis and over-treatment of many men.

Klotz believes that this trial would support a change in practice from relying on biopsies for all men with suspected prostate cancer to providing MRI first with selective targeted biopsy. He said that this approach would allow 250,000 men a year in the U.S. and Canada to avoid unnecessary biopsies and the associated complications including hospitalisation.

OICR's strategic priority is to improve the management of patients with early prostate cancer and to avoid over-diagnosis while ensuring men with prostate cancer get the treatment they need. Dr. Lincoln Stein, Interim Scientific Director of the Ontario-based research institute said that using MRI to image the prostate before biopsy will help reduce the number of unnecessary biopsies and their associated complications, while ensuring maximum precision for guiding the biopsy when and where it is really needed.

Data management and analysis for the trial will be conducted by the Ontario Clinical Oncology Group (OCOG) in the Escarpment Cancer Research Institute, a Hamilton Health Sciences and McMaster University institute.

"Approximately 20 years after PCC helped fund Dr. Klotz' watchful observation study, hundreds and hundreds of men with low-risk prostate cancer have had an option to avoid unnecessary treatment," said Dr. Stuart Edmonds, PCC's vice-president of Research and Health Promotion. ■

Further Information

The Movember Foundation is a global charity raising funds and awareness for men's health. Since 2003, $670 million has been raised to fund over 800 programmes through impact investments, focusing on prostate cancer, testicular cancer, poor mental health and physical inactivity. The annual Movember campaign in November is globally recognised for its fun and innovative approach to raise money and get men to take action for their health. **Movember.com**

Prostate Cancer Canada is the leading national foundation dedicated to the prevention of the most common cancer in men through research, advocacy, education, support and awareness. **prostatecancer.ca**

Ontario Institute for Cancer Research (OICR) is an innovative cancer research and development institute in Ontario, Canad, dedicated to prevention, early detection, diagnosis and treatment of cancer. OICR has key research efforts underway in small molecules, biologics, stem cells, imaging, genomics, informatics and bio-computing. **oicr.on.ca**

ULTRASOUND FIGHTS CANCER WITH MICROBUBBLES

SONOPORATION WITH CHEMOTHERAPY INCREASES POROSITY OF PANCREATIC CELLS

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Introduction

By enhancing the ability of cells to absorb chemotherapeutics, an ultrasound technique has nearly doubled the median patient survival time from diagnosis in a phase I clinical trial.

During our research at Haukeland University Hospital in Bergen, Norway, we have combined a laboratory ultrasound technique called "sonoporation" with the commercially-available chemotherapy compound Gemcitabine to increase the porosity of pancreatic cells with microbubbles and to help get the drug into cancer cells where it is needed.

The outcomes of a phase I clinical trial involved ten people undergoing treatment for pancreatic cancer. We found the new approach nearly doubled the median survival time from 7 months to 18 months without increased chemotherapy dosage and with no added toxicity or additional side effects. When we compared the amount of treatment our patients were able to undergo, compared to a historical cohort, we saw a significant increase of treatment cycles.

Technique Still at its Infancy

We are just at the infancy of this technique and there is a lot of potential to unlock. I only expect the results to get better and better.

In addition, we are working on a lot of improvement to this method developing from every aspect: from the basic physics and mechanics, to microbubble structure, pharmacokinetics, and first in kind *in vitro* and *in vivo* experiments, making sure our improvements translate into the clinical trials.

Nevertheless, these results are promising for a disease with an often poor prognosis. The one-year survival rate for all stages of pancreatic cancer combined is 20 percent, and the five-year survival rate is 6 percent, according to the American Cancer Society.

The fact that the overall survival can be improved is very important. In terms of the technique, its extremely important that it doesn't need specialised equipment, as this means that any hospital can start improving patients' (and their families') lives, and just as important, is that it can be applied to nearly any other form of cancer as long as the ultrasound can reach it. This opens up a whole new "playbook" for cancer treatment.

This is such a complex interaction that it combines all scientific fields (physics, engineering, chemistry (physical and molecular), pharmacology, cell biology, cancer pathology, and medicine). It's simply amazing that we reached so far so quickly. It's like going to a beach and finding that one stone with the perfect combination, its not easy. Once you find it, you can then polish it up and turn it into a piece of jewellery, that's the stage we are at now.

The concept of delivering payloads via ultrasound, or sonoporation, has been around for decades, and was initially used to enhance gene uptake. I first became involved while working on my doctorate at the University of Hull in the United Kingdom, ultimately delving into interactions between cells and bubbles during short bursts of ultrasound exposure.

During that time, a collaboration with a group of French biologists led to the technical development of forcing single microbubbles into a cell with ultrasound — opening the door to forcing any number of other compounds into the cell. As one of the largest barriers to a drug's efficacy is its ability to permeate a cell membrane, this was a significant development — one that I took with me to a postdoctoral fellowship in Bergen, translating the laboratory concepts to a clinical bedside.

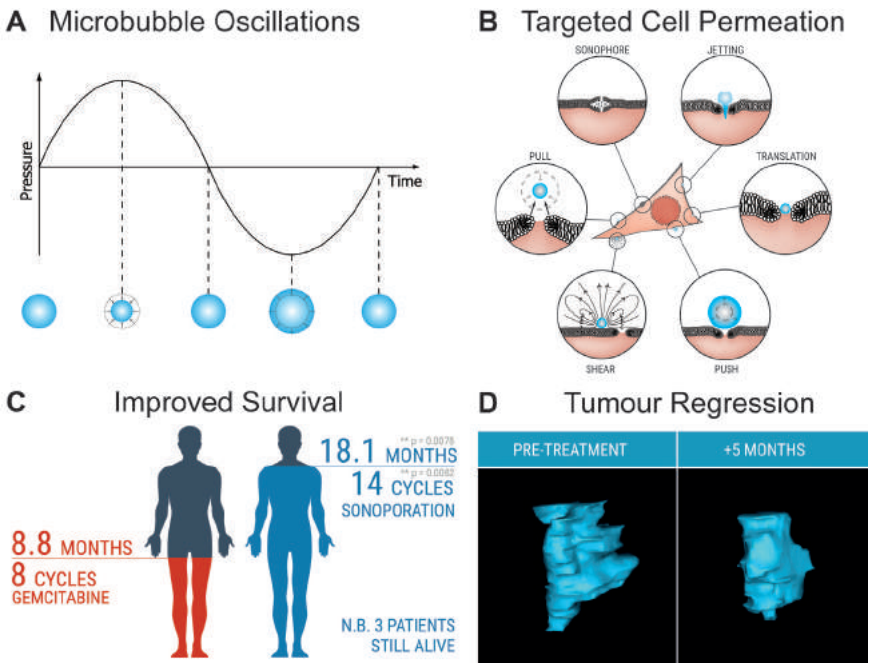
> "WE ARE JUST AT THE INFANCY OF THIS TECHNIQUE AND THERE IS A LOT OF POTENTIAL TO UNLOCK"

Using Technology and Materials Available on the Market

For our phase I clinical trial, we recruited a cohort of ten volunteers who had locally advanced or metastatic pancreatic adenocarcinoma. To facilitate more rapid clinical translation, our team of researchers and clinicians agreed to use technology and materials already available on the market at every step.

If this worked, in 20 years, we didn't want a hospital to have to purchase specialised, expensive, one-use equipment.

Our equipment consisted of a slightly older clinical diagnostic ultrasound scanner, the GE Logiq 9, combined with a 4C abdominal ultrasound probe. Using a diagnostic ultrasound scanner also allowed us to see and treat the tumour in real time. To generate the microbubbles, we used SonoVue, a sulphur hexafluoride-based solution commonly used to help diagnose liver lesions through ultrasound. Since the



A microbubble (2micon in diameter) is excited by an ultrasound wave (A), which in turn interacts with a cell in many different ways allowing increased drug uptake (B). When performing this in patients, more treatment can be performed, survival increases (C) and tumour recession can be observed (D).

bubbles are only stable in the blood stream for a few minutes, we decided to inject a small amount every three and a half minutes.

We began the procedure by administering standard chemotherapy to the patients according to the existing protocol. Once the chemotherapeutic concentration in the blood reached its maximum, the ultrasound scanner was used to induce sonoporation for 31.5 minutes, at 3.5 minute intervals.

The microbubble's permeability-enhancing mechanism of action is somewhat opaque, but is believed to be one of two methods.

At high acoustic pressures, microbubbles undergo inertial cavitation — an implosion that creates tiny pores in the cell, allowing a greater concentration of drugs to enter. This effect, which includes shockwaves, may penetrate deeper into the tissue, thus having a deeper effect. Due to potentially violent ripple effects — similar to throwing a cannonball against a wall — this is generally avoided.

At low to moderate acoustic pressures, the bubbles tend to interact with cells, bouncing and rolling against them to push and pull the membrane, occasionally entering the cells — more akin to cracking open a safe by drilling some small, precise holes.

When treated with sonoporation, the volunteers were able to undergo 14 (±6) cycles of treatment, versus 8 (±6) with normal chemotherapy.

This ultimately had the effect of stabilising or decreasing the tumour volumes in 50 percent of the patients and increasing the median patient survival time from approximately 7 months to 18 months.

Future Work

Future work will include performing a larger-scale phase I/II clinical trial with international collaborators, and working to develop a microbubble compound optimised for targeted drug-delivery at low acoustic intensities. We will also seek to fully understand the mechanisms of sonoporation by using advanced mouse models and bioreactors. ■

Key Points

- ✓ New approach doubled survival time from 7 months to 18 months without increased chemotherapy dosage.
- ✓ Results are promising for a disease with an often poor prognosis.
- ✓ Using technology and materials already available on the market.

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Kotopoulis S, Dimcevski G, Gilja O (2016) Ultrasound- and microbubble-enhanced chemotherapy for treating pancreatic cancer: A phase I clinical trial. Abstract #3aBA6, 171st Meeting of the Acoustical Society of America (ASA) May 23-27, 2016, Salt Lake City, Utah, USA. [Accessed: 16 June 2016] Available from http://acousticalsociety.org/content/spring-2016-meeting

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RADIOLOGY IN IRAN

COMING OUT OF SANCTIONS

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An Overview

The Iranian Society of Radiology (ISR) is the largest in the Middle East and Levant region, with the only other country with more radiologists in this area being Turkey. Presently, there are about 2,400 radiologists practicing in Iran – the Iranian society was founded in 1966 and is now one the largest and best organised medical associations in the country.

Currently, there are 17 radiology training programmes running all over the country with around 150 residents graduating every year. Radiology training is a four-year residency programme, being a highly competitive choice for medical students and there are about 200 academic radiologists all over the country.

The main area of preference in the practice of radiology is still "general radiology" but there is a growing demand and interest for sub-specialty imaging services. Solo radiology practice is the predominant form of establishing and running radiology centres in the country, but group practices with about five to ten radiologists is a growing trend, thus allowing for the provision of subspecialty services to be tailored to national needs.

The majority of Iranian radiologists dedicate themselves to general radiology and run imaging centres employing X-ray, ultrasound, mammography and dental imaging equipment.

Only a minority of imaging centres – which are usually owned and run by groups of radiologists – use cross-sectional imaging equipment.

Annual congresses of radiology and refresher courses play a major role in post-graduate training, which is a significant ongoing demand, considering the rapid developments taking place internationally in the field of radiology. This makes Iran's annual congress of radiology, which is the largest in the region and held every May, a bridge that connects the Iranian radiological community with modern medical imaging worldwide.

Impact From Sanctions

Although sanctions against Iran have had a devastating effect on medical imaging, currently the situation is changing and the radiology community is hopeful that it will face better conditions ahead. As Iran is a great regional market for vendors, when the removal of sanctions relieve this action, major companies will get access to the largest potential market for radiological equipment in the whole region.

We could say that one of the "positive impacts" that the sanctions had on the Iranian radiology sector was the introduction of picture archive communication systems (PACS) in medical imaging technology, as well as the practice of filmless or 'less film' radiology. Because of the limited availability of films, PACS installation and CD/DVD image distribution was adopted very rapidly during the sanction period. Of course, the market leaders of PACS and imaging informatics solutions are mostly local vendors and the market is still very much promising for reasonable internationally approved products in this field.

Looking Ahead

Teleradiology is becoming more and more popular in Iran and a growing number of radiologists and clinicians view the medical images retrieved remotely as an ideal solution, despite the lack of nationally-approved rules and regulations for teleradiology practice in the country.

From the last meeting of the Eurasian Radiology Initiative's Executive Committee, where Mansoor Fatehi was elected President of the first Eurasian Congress of Radiology

Hybrid imaging is a missing sector altogether in the Iranian radiology arena. There are only a handful of PET/CT installations in the country which is clearly far less than what we actually need. The biggest obstacle in the availability of hybrid imaging equipment has been the sanctions that have been imposed on Iran that prevented the free import of machines and equipment into the country.

> "THERE ARE ONLY A HANDFUL OF PET/CT INSTALLATIONS IN THE COUNTRY WHICH IS CLEARLY FAR LESS THAN WHAT WE ACTUALLY NEED"

Regional Cooperation

The Iranian radiological community has a very good relationship with the regional and international communities. There are a number of ongoing agreements and protocols of cooperation between the Iranian Society of Radiology and all neighbouring countries including Turkey, Iraq, Pakistan and Afghanistan. Also, Iran is playing a leading role in the establishment of a regional radiological community under the banner of the Eurasian Radiology Initiative. Iran is a founding and key driver in this exciting project that aims to cover regional collaboration between 34 countries. Iran will host the first Eurasian Congress of Radiology at Kish Island later this year.

Key Points

- ✓ Iran has 2,400 practicing radiologists, the second largest community in the Middle East.
- ✓ Around 150 radiologists graduate each year.
- ✓ Playing a leading role in the establishment of the regional Eurasian Radiology Initiative.
- ✓ Sanctions have prevented the free import of machines and equipment.

End of Sanctions. What Next?

The imposition of sanctions on Iran has made any scientific collaboration with international radiological communities extremely difficult. Inviting and including guest scientists at meetings or events hosted by departments of radiology were hampered by political issues. Also, the participation of Iranian scientists in international radiology events has been limited due to the restricting barriers in securing a visa. Hopefully, after the removal of the sanctions, the scientific collaboration with the international community will be restored and will even expand. All international speakers who visited the country during the past decade have expressed their surprise that, "Iran is much better than what we see in the media!" ■

Resources:
Iranian Society of Radiology (ISR) - **isr.org.ir**
Eurasian Radiology Initiative - **earad.org**

FACTS ABOUT IRAN (Islamic Republic of)	
Total population (2015)	79,109,000
Gross national income per capita (PPP international $, 2013)	15
Life expectancy at birth m/f (years, 2015)	74/77
Probability of dying under five (per 1 000 live births, 0)	(N/A)
Total expenditure on health per capita (Intl $, 2013)	1,414
Total expenditure on health as % of GDP (2013)	6.7

Source:
World Health Organisation (2013-2015) Iran Country Statistics who.int/countries/irn/en/

"I'm a great believer in luck, and I find the harder I work the more I have of it."

PETER M. FLEISCHUT

CHIEF INNOVATION OFFICER AT NEWYORK-PRESBYTERIAN

What would you single out as a career highlight?
Seeing the NewYork-Presbyterian IT Innovation team in action. Watching people use and leverage our tech infrastructure to its full potential is truly top-notch. I'm impressed by the NewYork-Presbyterian team every day.

"To reach something good, it is useful to have gone astray – humility is truth" -

Saint Teresa of Avila.

LAURA OLEAGA

CHAIR OF THE ESR EDUCATION COMMITTEE.

What is your top management tip?
For a proper relationship at work it is important to be honest and direct and to promote the collaboration of all the professionals involved in the process of patient care.

"The secret of quality is love" - *Avedis Donabedian.*

ROBERT W. WACHTER

HOSPITALIST, WRITER AND PROFESSOR AND INTERIM CHAIR OF THE DEPARTMENT OF MEDICINE AT THE UNIVERSITY OF CALIFORNIA, SAN FRANCISCO.

What is your top management tip?
Hire the best people, support the hell out of them, try to inspire them, but don't micromanage them.

BARBARA RIEGEL

PROFESSOR AND EDITH CLEMMER STEINBRIGHT CHAIR OF GERONTOLOGY.

"You must be the change you wish to see in the world" -

Mahatma Gandhi.

What would you single out as a career highlight?
The year I was designated as a Distinguished Scientist by the American Heart Association and receipt of an endowed chair in gerontology at the University of Pennsylvania, School of Nursing.

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