



COVER STORY

Care Continuum

IDEA • BIG DATA • RADIOLOGY • CARDIOLOGY



SPOTLIGHT

Lluís Donoso Bach, President,
European Society of Radiology

MANAGEMENT MATTERS

Success Isn't Everything
Leadership Crisis in Healthcare
Entrepreneurial Doctors

BEST PRACTICE

Computer-Determined Interpretation
Bedside Ultrasonography

Enterprise Imaging

Steering the Integration Agenda
MRI Care Pathway

Resource Allocation in Healthcare

Effective Leadership in the 21st Century
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CARE CONTINUUM

The care continuum is well upon us and has become a rapidly evolving concept as the medical profession tries to move forward while keeping abreast of developments in and around the health sector.

Radiology's role in the care continuum is a matter I have witnessed and personally dealt with during my experiences at Hospital Clinic Barcelona when piloting the ESR *iGuide* imaging referral guidelines. In an academic institution such as ours, it gave us the opportunity to deal directly with general practitioners (GPs).

Previously, the GP used to refer a patient to the specialist; the specialist sent the request to radiology, then radiology sent the patient back to the specialist. Now, the GP is using clinical decision support, for example in the case of a patient with a knee problem, and if the examination is justified, the request goes directly to radiology. In all patient cases when the finding is normal, the GP can manage the situation without sending the patient to the specialist. Thus, with the use of these tools and the direct involvement of the radiology department with the GPs, we can make the system more efficient from the process point of view, while becoming less burdensome on the patients themselves, thus completing the care continuum cycle.

Management Matters

This brings me to the second concept within this edition: Management Matters.

As the care continuum will continue to involve more and more people, health-care stakeholders, patient support and —most importantly in demanding financial environments —cost efficiencies, it is vital that medical professionals keep a balance between best practices and modern management tools, whether in a small department or a major organisation.

Management Matters will focus on the latest, the most innovative and insightful perspectives and tips from healthcare and business leaders to inspire you in your practice.

Good leadership is based on good knowledge – the more we know, the better we can be prepared to tackle our everyday issues.



Lluís Donoso Bach

Editor-in-Chief IMAGING
HealthManagement.org - The Journal

President European Society of Radiology

Director, Diagnostic Imaging Department,
Hospital Clinic University of Barcelona, Spain

Executive Director, UDIAT Diagnostic Centre,
Health Corporation Parc, Taulí, Spain

Operational Headquarters:

166 Agias Filaxeos
CY-3083 Limassol, Cyprus
Tel: +357 25 822 133
Fax: +32 2 2868508
E-mail: office@healthmanagement.org

Brussels Liaison Office:

Rue Villain XIV 53-55
B-1000 Brussels, Belgium
Tel: +32 2 2868500
Fax: +32 2 2868508
E-mail: eu@healthmanagement.org

Project Director

Iphigenia Papaioanou
i@healthmanagement.org

Managing Editors

Masis der Parthogh
mdp@healthmanagement.org

Claire Pillar

cp@healthmanagement.org

Senior Editor

Lucie Robson
lr@healthmanagement.org

Americas Region Editor

Samna Ghani
sg@healthmanagement.org

APAC Region Editor

Dran Coronado
dc@healthmanagement.org

Editorial Assistant

Dana Ungureanu
office@healthmanagement.org

Project Managers

Luiza Kudelka
luiza@healthmanagement.org

Katya Mitreva

katya@healthmanagement.org

Majk Kobas

majk@healthmanagement.org

Director, Corporate Engagement Programme

Carine Khoury
ck@healthmanagement.org

Art Director

Marilena Patatini
art1@mindbyte.eu

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INDUSTRY ADVISERS

Marc De Fré, Belgium

Prof. Mathias Goyen, UK

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CONTRIBUTORS

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REGULAR CONTRIBUTORS

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ECR 2016 No. 203, Expo X3.

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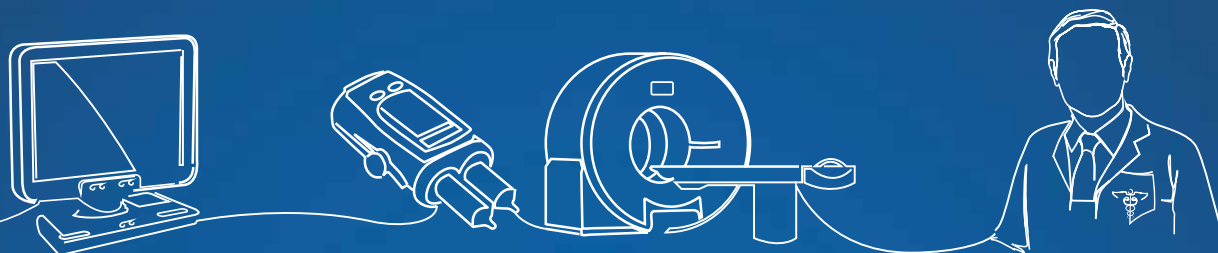
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Seamlessly Smart



EUROPEAN RADIOLOGY

INTERVIEW WITH PROFESSOR LLUÍS DONOSO,
PRESIDENT, EUROPEAN SOCIETY OF RADIOLOGY



Lluís Donoso Bach

Editor-in-Chief IMAGING
HealthManagement.org -
The Journal

President European
Society of Radiology

Director, Diagnostic Imaging
Department, Hospital Clínic
University of Barcelona, Spain

Executive Director, UDIAT
Diagnostic Centre, Health
Corporation Parc, Taulí, Spain

As *HealthManagement.org The Journal's* Imaging Editor-in-Chief, Professor Lluís Donoso, comes to the end of his term as President of the European Society of Radiology (ESR), we took the opportunity to speak to him about developments at the ESR, the state of radiology, and the role of management and leadership.

How have you enjoyed your term as President of the ESR?

I was quite sure that it was going to be a lot of work, but I took a positive and optimistic approach, and I've had fun! There have been many projects, good interactions with people and new situations – it has been a good experience.

What have been the highlights?

Membership

We are continuously increasing our membership, and have more than 63,000 members. Half of our members are now outside Europe. Around 22 percent are from Asia and around 16 percent from Latin America.

Education

I am looking forward to the European Congress of Radiology (ECR) 2016, where we expect great participation. We are attracting more delegates to ECR Live. From its start three years ago, numbers are steadily increasing – from 1500 at the start to an expected 7000 this year.

We have increasing educational opportunities not only in Europe but also in Asia, and especially in Latin America. We have launched our e-learning platform Education on Demand. The European Training Curriculum for Radiology is increasingly being endorsed in different countries – Brazil is using it now, for example. The European Diploma in Radiology (EDiR) is also going from strength to strength, and we are planning to change the platform in order to make it more efficient and accessible for our members. We aim to have 140 applicants taking the EDiR during ECR this year and will reach around one thousand radiologists having the diploma in 2016. As the EDiR gains momentum and prestige, the easier it will become to have the EDiR as a requirement for employment or even certification in future.

Publications

To join *European Radiology* and *Insights into Imaging* we are launching a third journal, which will be open source. The name is still to be confirmed.

Cross-Collaboration

We want to encourage more radiographers to join. We are in contact with national radiography societies around Europe to offer them membership of the society so that they can

participate more in our educational activities, services and in ECR. We also work together well with the other allied sciences, especially with the medical physicists.

European Society of Hybrid Imaging

Another highlight is the creation of the European Society for Hybrid Medical Imaging, which will be launched at ECR 2016. We recognise the necessity to provide tools for education and training for our members about functional molecular imaging. The Society's first president is Professor Katrine Åhlström Riklund, who is also the President of ECR 2016.

Research

Through the European Institute for Biomedical Imaging Research (EIBIR) we have been really successful this year in terms of application for research infrastructure at the European level (a 24 percent success rate for applications, when usually it is around 4 percent).

What advice would you give ESR members who are thinking of taking up leadership roles in the society?

There are many opportunities in our institutional committees, sub-committees and working groups. Hundreds of members are already directly involved in management and different areas of the Society. For younger radiologists we have the Radiology Trainees Forum and the Invest in the Youth programme to enable people to attend the ECR. We have also created a new sub-committee of the National Societies Committee, the Professional Issues and Economics in Radiology (PIER) sub-committee. This includes the former Management in Radiology (MIR) sub-committee. We also have the ESR Leadership Institute, which consists of radiologists who can act as present and future opinion leaders. So we are identifying people with the potential to be the society's leaders in the future. My advice would be to get in touch, be active and don't be shy!

You mentioned that you have been reaching out to radiographers. What is your opinion on extended roles for radiographers?

The roles of radiographers in daily practice are quite heterogeneous across Europe. As radiologists we value their involvement in as much of the radiological process as possible – acquiring the images and even analysing and preparing the images. However, the final report does have to be made by a radiologist. The radiographer's role is invaluable. At the ESR we would like to have more radiographer members, and we would like them to be as visible and active as possible in providing imaging services.

Can you comment on the progress of the ESR's Call for a European Action Plan for Medical Imaging (ESR 2014)?

Since we launched this project in November 2015, we have been meeting with the offices of the various European Union Directorate-Generals (DGs) — DG Sante, DG Health, DG Connect, DG Energy. We are focusing our efforts on radiation protection, as the Basic Safety Standards (EURATOM) directive has to be implemented by member states by February 2018. So the Society is offering its services to help in the implementation at national level.

The ESR with the European Respiratory Society published a white paper on lung cancer screening (Kauczor et al. 2015a). Do you expect to see screening programmes set up in Europe?

The scientific basis is well established, and we need to stratify the patients who will benefit. I think sooner rather than later we will have these programmes established. As ever, the problem is the finances.

Are you optimistic about the future of radiology?

I have always been an optimist. Radiology has plenty of threats, but only those who have opportunities have threats. It would be more worrying if we had none! Having threats means that radiologists are in the centre of the health system, and we are becoming more and more important. We have to be flexible, we have to be smart and proactive, but I think we can be optimistic about the future of radiology and imaging.

Are there any threats that worry you in particular?

There are the threats of commoditisation, use of computers in diagnosis and turf battles with other specialties. For me the main threat is the shortage of radiologists. That can lead to other specialties taking our "turf".

How is the ESR iGuide project on imaging referral guidelines going?

We are continuing work on 'Europeanising' the American College of Radiology (ACR) criteria, and have created a rapid response group with the ACR on this. Pilots are continuing in France, Spain, Sweden and the UK. We are on schedule.

The European Society of Cardiology has established an MBA programme in conjunction with the London School of Economics, and they will hold a specific management congress. What will the ESR offer on management and leadership in the future?

We have the Leadership Institute already and the Management in Radiology sub-committee's work will continue through the new committee Professional Issues and Economics in Radiology (PIER). It's extremely important for our members to be trained in leadership and management skills. We need to find the best approaches to be more efficient and attract more people to these courses.

Mentoring is very useful to professionals at the start of their careers. Did you benefit from having a mentor? Do you think that the ESR could help in mentoring programmes?

Mentoring was definitely very important for me. I trained in

Barcelona at the Hospital de Sant Pau with Professor José Cáceres. His mentoring was so important for my career. Mentoring is something for the ESR to consider, certainly. We don't have formally organised programmes yet.

As a society with over 60,000 members how can you stay responsive to your membership?

We try to be as close as possible. We have established an office in Colombia, in Latin America, as we have so many members there. We are investing greatly in our online efforts and resources, for example ESR Education on Demand, and ECR Live, including interactive possibilities. Through the European School of Radiology (ESOR) we are also organising courses in Asia and in Latin America. Mostly through the Internet we can keep in contact with the majority.

“RADIOLOGY HAS PLENTY OF THREATS, BUT ONLY THOSE WHO HAVE OPPORTUNITIES HAVE THREATS”

You have talked about maintaining the integrity of radiology and suggested that radiology should focus more on the clinical field. Please expand on this.

It is important for us to keep our technological profile in order to keep the specialty with clear distinct content. We are getting closer and closer to the clinicians and working actively on specific diseases with clinical profiles. As we face in some parts of Europe a shortage of radiologists, sometimes we have to decide where to focus more. The clinical approach is important. We need to take care of the technology together with radiographers, medical physicists, bioinformaticists, biochemists — all these professionals have to be involved in our department in order to get the technology at the highest level. We have to be closer to the clinicians and to the patients. One important factor for radiologists is that we are used to, and probably better than, other clinicians in managing high technology. With this technology we work together efficiently with clinicians and patients keeping security and quality central to the mission. This is key in order to keep our specialty integrated, important and visible at the institutional level.

The ESR Working Group on Economics produced a paper on the economic crisis (ESR 2015b), in which they recommended appropriate use of existing services, robust equipment replacement programmes and coordinated workforce plans. How is the ESR going forward with these recommendations?

We aim to provide the best possible information on the situation of different European countries. We collect information on the age of the installed equipment in order to get an idea

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of the equipment available in one specific region or country and the level of performance of this equipment. This information will help people to make their cases to improve technology. One of the possible applications of the *ESR iGuide* as a decision support tool is in relation to equipment. The appropriateness criteria experience in the U.S. was to diminish or flatten the trend of increased examinations. However, in other places the situation could be that the appropriate examination is MRI, but if you simply do not have an MRI scanner, this can help to make the case to install it in order to give the patient the best service possible.

On workforce, we have a lot of information in the ESR Imaging Observatory, for example the number of radiologists per inhabitant in different parts of Europe. It is variable, and of course the situation in one country can impact on another. For example, the UK has a high proportion of unfilled radiologist positions, and they are trying to hire radiologists from Eastern Europe in particular. It is a problem, and it is not easy to help everyone.

“IT’S EXTREMELY IMPORTANT FOR OUR MEMBERS TO BE TRAINED IN LEADERSHIP AND MANAGEMENT SKILLS”

In your Zoom On profile for HealthManagement.org your top management tip is “Delegation”. Do you have further tips to share?

Delegation is important, but to delegate you have to employ the best people. You need to take care of the people working in the department. By taking care I mean provide them with their own career, help them to be as good as possible. I spend quite a lot of time with people in my department so that they have their own personal projects and are working together. Having an organisation and just telling everyone what they are supposed to do will not work. In future we have to be more horizontal in our organisations. ■

Prof. Donoso trained at the Autonomous University of Barcelona School of Medicine where he received his MD and PhD. In 1992 he became Chairman of the Radiology Department of the UDIAT Diagnostic Centre at the Corporació Sanitària Parc Taulí, and he was appointed Executive Director in 1998. Under his leadership a large R&D team was established at UDIAT, leading to several patents and innovations. In 2006 he joined Hospital Clinic of Barcelona, when he also became Associate Professor of the Faculty of Medicine of Barcelona University.

Prof. Donoso was Vice-President of the Spanish Society for Diagnostic Radiology (SERAM) from 1998 to 2002. He was elected President in 2002 and finished his term in 2006. He has been awarded the Gold Medal of the Spanish Society of Radiology. He is President of the Spanish Foundation of Radiology, and holds honorary memberships of the national societies of radiology of Argentina, France, Germany, Italy and Mexico. Prior to becoming ESR President, he served on the Executive Council and was Chairman of the Professional Organization Committee.

Prof. Donoso has published over 110 articles, seven book chapters, and has given numerous invited lectures at prestigious universities, congresses, and courses.



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BIG DRAMA IN IT SECURITY!

RECENT HOSPITAL VIRUS ATTACKS AND RANSOM PAYMENTS TRIGGER URGENT CALL FOR ACTION



Lucie Robson

Senior Editor
HealthManagement.org
lr@healthmanagement.org
@ehealthmgmt

Recent cases of cyber-attacks, intentionally breaching the security infrastructures of hospitals around the globe, have raised serious questions about how to tackle such malicious invasions. No matter if it was for financial gain or the simple thrill of having broken through the iron-clad firewalls set up by IT giants.

The European Association of Healthcare IT Managers (HITM hitm.org) has no time for the FBI's stance on how hospitals should deal with hacker attacks.

While last autumn the U.S. intelligence agency controversially advised organisations to give in to criminals who paralyse their IT systems and pay the ransom to regain access to information, the HITM says the problem needs to be dealt with at a deeper level.

"We encourage software vendors to invest more in security, and our members and the IT community in general to set up systems that are not vulnerable to hacking," HITM Secretary General, Christian Marolt told HealthManagement.org.

"A government will never pay ransom for the release of a citizen held hostage, as it will just trigger more such incidents; we firmly believe that healthcare shouldn't give in to hacking blackmailers either."

The HITM endorses the professional authority and responsibility of healthcare IT managers and represents their interests to international institutions and associations.

Marolt was speaking following the infamous payment of what was reported as 40 Bitcoins or 17,000 U.S. dollars to unknown blackmailers by the Hollywood Presbyterian Medical Center after its IT systems were brought to a standstill by ransomware in early February.

Reportedly, staff were forced to return to the not-so-distant 'old days' of communication by phone and fax, while emergency patients had to be transferred to neighbouring hospitals. But the high-tech hospital said that patient records were never compromised during the attack by the ransomware virus.

Security Focus

"We urge any hospital to reject a ransom request," Marolt said. "The emphasis must be put on better security. There are still hospitals in Europe operating on last-century legacy, not able to deal with these kinds of attacks."

Marolt added that we seriously need to question our IT security when a simple malicious email, opened in error, can bring any size hospital to a standstill. Consider the outcry if this would happen to an airliner!

"When you reflect on the pressure and level of stress hospital staff is exposed to, how can you be surprised that

one may open a malicious email by mistake?"

Ransomware is a type of malware that locks a computer's functions until a fee is paid by the owner of the computer or network. Typically, computers display a message with a countdown timer that threatens the wiping of all data stored on the computer if the ransom is not paid on time.

“ NO GOVERNMENT PAYS RANSOM FOR THE RELEASE OF A CITIZEN HELD HOSTAGE. HEALTHCARE SHOULDN'T GIVE IN TO BLACKMAILERS EITHER ”

The preferred hacker currency is Bitcoin, a digital currency created and held electronically. It is not under the control of any sole person or body and neither is it printed. Why do hackers use it? It is nearly impossible to track once it is released.

The FBI and other organisations like the German Bundesamt für Sicherheit in der Informationstechnik (BSI) warned about the vulnerability of the healthcare sector in 2014 and the following year saw a sharp rise in cyber-attacks. Under U.S. government law, hospitals are obliged to report potential breaches of medical data security, if they involve more than 500 people. In Europe, the laws are not so clear.

A cyber-attack brought the almost fully paperless Lukas Hospital in Neuss, North Rhine-Westphalia, Germany to a standstill for two weeks. This raised serious concerns about the lack of pan-European reporting protocols when dealing with such malicious viruses.

The IT systems of the 540-bed hospital were infected by a virus, which experts said had been sent as an email attachment and probably opened by mistake. As with Hollywood Presbyterian, severe emergency department (ED) cases were transferred to other hospitals.

After the attack, the hospital confirmed in a statement that the cause for the breakdown was a malicious virus sent from an unknown source, but added that the action did not appear to be targeted, as there was no blackmail attempt. Top IT experts from Germany and the UK had to be called in to get the problem under control.



Source: rp-online.de

Hidden Attacks

However, the HITM praised the Lukas Hospital for being transparent about the attack. “A serious worry seems to be the lack of clear criteria in IT security law for reporting on cyber-attacks. Lukas Hospital made a courageous step forward to immediately inform the public. This transparency encourages trust in the institution and helps to counter future attacks much more easily,” said Marolt.

According to German media, two other hospitals and a company had also been affected by the virus around the same time, but the incidents had not been made public.

“In such context serious questions have to be asked:

- how many companies in Europe, and around the Globe, apply ‘strict secrecy’ over cyber-attacks and cover them up?
- How many of them pay ransom?
- And how many hide financial losses from such attacks cleverly in their balance sheet?” Marolt asked.

The cyber-attacks lead to bigger questions about the impact of technology in healthcare. You only have to consult one of the many bespoke groups representing patient interests to discover that the takeover of healthcare by IT is not all coming up smelling of roses.

While IT applications like the employment of Big Data in diagnostics and Geographic Information Systems for improving workplace management and upgrading patient care are paving the way for better outcomes, there are still many people who aren’t yet convinced about the benefit in using an app over a face-to-face consultation.

That’s not to home in on mHealth either which, as with all new and developing technology, has pros and cons. Across the board, from the use of Electronic Health Records to robotically-assisted surgery, while one hand gives with cutting-edge technology, the other takes away with the amount of time, training upgrades and expense needed to implement the full panoply of IT applications at medics’ disposal.

While governments and NGOs tout paperless hospitals,

spending billions on the process of reaching this goal with the aim always to ‘improve care’, at what cost - both literally and ethically? Take the National Health Service in England, for example, which just announced a 4.2 billion pound investment plan for bringing care into the modern age by 2020. When digitalisation does not go hand-in-hand with a dramatic upgrade to state-of-the-art IT infrastructure, we are playing digital “Russian Roulette”.

“ ALL IT ATTACKS MUST BE MADE PUBLIC ”

What will happen if hospitals do give in to the ransom demands of cyber- blackmailers? The ‘reassuring’ comments about the safety of patient data, and that ransom fees are not that high after all, just don’t add up. What does it really mean for the IT security future of hospitals?

“Today hackers may demand a few thousand dollars and lock a computer system for a few days,” said Marolt. “But if they’re successful, what about tomorrow?” ■

Key Points

- ✓ Cyber-attacks are on the rise, and hospitals have fallen victim.
- ✓ Controversially, the FBI advised organisations to pay ransoms to regain access to their information.
- ✓ The European Association of Healthcare IT Managers recommends tightened security, and transparency from hospitals that are attacked.

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Every week HealthManagement.org publishes top healthcare management, leadership and best practice news of the week in dedicated newsletters. We know you're busy, so we do all the work and pick the best three stories to send you. Read on for a variety of topics that piqued record interest recently and pick up pointers for running your team, department, planning a project or just keeping that keyboard clean.

'Secret' to Cause of Higher Weekend Death Toll?

A study published in *Emergency Medicine Journal* shows that patients admitted in medical emergencies during the weekend are usually older and more dependent as compared to patients admitted on other days of the week. This could explain the high death toll of patients admitted in emergency on weekends. See more at <https://iii.hm/2dd>

Has Evidence-Based Medicine Gone Too Far?

Rigid adherence to evidence-based medicine does not serve healthcare well, according to the authors of a review published in *Health Research Policy and Systems*. The tools that are suitable for discovery are unsuitable when it comes to implementation in healthcare services, they suggest. See more at <https://iii.hm/2de>

High-Rise Building Residents have Low Cardiac Arrest Survival Rates

A Canadian study has found that survival rates from cardiac arrest decrease the higher up the building a person lives. The study is published in the *Canadian Medical Association Journal*. Recommendations include improving the accessibility of automated external defibrillators and placing them on building floors, lobbies and inside elevators; giving paramedics a universal elevator key; and finding ways to alert building security that 911-initiated first responders are on their way. See more at: <https://iii.hm/2df>

How Clean is Your Keyboard?

Bugs may be lurking where you might not expect them – in keyboards, mice and other parts of the clinical computer workstation, according to a study from Australia. Let's hope you are reading this on a tablet or phone? See more at <https://iii.hm/2dg>

Harnessing Motivation to Change Doctor Behaviour

Motivated physicians play an important role in providing high-quality healthcare. As such, policy makers and hospital leaders are continually looking for ways to optimise physician behaviour and ensure better care delivery. What's needed is to find the right mix of physician motivators to improve efficiency and productivity, according to a Viewpoint article published in JAMA. See more at <https://iii.hm/2dh>

Is Radiology Entering a Dark Age?

What do the threats to radiology from low recruitment of entrants to radiology in the United States, computer-determined / computer-aided detection and liquid biopsy mean for the profession? Professor Stephen Baker presented a cautionary tale at the 2015 Management in Radiology annual meeting. See more at <https://iii.hm/2di>

Imaging for Chest Pain - New Recommendations

The American College of Cardiology and American College of Radiology have released new recommendations for diagnosing chest pain in the emergency department. The document outlines appropriate use of diagnostic imaging in 20 fundamental clinical scenarios for emergency imaging for chest pain. See more at <https://iii.hm/2dj>

4 Lessons for Radiology from Management Consultancy

As management consultancy has developed to become big business, the profession does have lessons for radiologists, according to an article in the *Journal of the American College of Radiology*. And the thorough performance reviews and high value professional development available to management consultants should be top of the list, argue the authors. See more at <https://iii.hm/2dk>

Battle Against Health Data Hacks Gains Momentum

Two health bodies have joined forces to fight a rise in healthcare IT cybersecurity risks. The Electronic Healthcare Network Accreditation Commission (EHNAC) and the National Health Information Sharing and Analysis Center (NH-ISAC) have signed a Memorandum of Understanding. Lee Barrett, executive director of EHNAC, said, "With the dedicated focus of our collaborative teams, NH-ISAC and EHNAC look to make great strides in effective awareness and prevention tactics to minimise the crippling impact of these cybersecurity attacks." <https://iii.hm/2dl>

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SUCCESS ISN'T EVERYTHING



Paul Ballman

Writer

Head of Leadership
Development
Vodafone
London, UK

Paul.ballman@btinternet.com

redpill-leadership.com

Over the past few months I have discussed my book, *Red Pill*, with a range of colleagues and shown chapters to a few. As the book points out some of the flaws in conventional thinking, they normally come back to me with the same question. “What does work then?”

This has caused me to think deeply about what their question actually means. It has also highlighted to me what an important question it is to so many people. “What worked?”, “How do you succeed?” — these are the killer questions to the degree that we don’t even realise that we are bound by them. For success — a solution “working” — seems to be the ultimate measure. “Does it work?” seems to trump every other question. People treat it as the ultimate test of worth. “Yes, yes,” they say, “that all sounds very good in theory, but does it work?” If you wish to be grounded and in control, this really does seem to be the question to ask. However, I want to share with you an alternative way of seeing the world — a world where “does it work?” may not be the most important question. Let’s start at the beginning, with the conventional view of business success.

In many ways business success is very straightforward. If business is about shareholder value, then we can demonstrate success with a range of business metrics. The starting point for most people when they want to identify a successful business is likely to be one of the following:

- Revenue;
- Revenue growth;
- Return on investment;
- Profitability;
- Profit growth;
- Market share;
- Market capitalisation;
- Share price;
- Dividend growth.

Some of these can trade off against others, but if a business is balancing them well or at least in the intended way, we would consider it successful, and so look at what the leaders are doing to create this success. This in turn may lead us to a whole set of other measures that impact the financial ones, such as customer satisfaction and employee engagement. In this world, our mission is to create sustainable business success. As leaders we know that actions that lead to this success are good and actions that put it at risk are bad. So far, so simple.

Ultimate Justification

Given the importance of these financial metrics, we increasingly see them being used to legitimise actions or activities that have a higher purpose. Take, for example, the issue of

diversity in the workplace and in particular the role of women leaders. A typical study by Jo et al. (2011) makes the case very clearly. They found that Fortune 500 companies with three or more women in board positions created a competitive advantage over companies with no women on their boards. In particular in the following three areas:

- Return on sales: 84 percent advantage;
- Return on invested capital: 60 percent advantage;
- Return on equity: 46 percent advantage.

It certainly does seem to make a good case for diversity. Similar arguments are made for other noble causes. Ethisphere tells us that the world’s most ethical companies’ stocks have grown at twice the rate of the S&P500 (Ethisphere 2011). We

“ I WILL TRY MY BEST TO SUCCEED, BUT IF I FAIL I AT LEAST WANT THE CONSOLATION THAT I DIDN’T LOSE MY PRINCIPLES ALONG THE WAY ”

hear how authentic leaders bring about great business results. For example, *Harvard Business Review* cites the authenticity of Anne Mulcahy as being responsible for the trebling of the stock price of Xerox (George and McClean 2005).

As I read back on the words I have written I feel a curious mixture of delight and dismay. I am delighted that we can embrace diversity, act ethically and be authentic and still achieve great business success. It makes me happy to live in a world where this is the case. However, the dismay I feel is that financial success has somehow become the measure of such things. Someone has felt the need to demonstrate these facts in order to give the behaviours legitimacy. If we are saying “Look! Having women leaders on the Board is good for business” aren’t we in danger of becoming slaves to that rationale? If a study next week showed that white male-dominated business had started to perform well would that cause us to reject diversity? If unethical leaders improved share price would that make it OK? If faking it rather than being authentic boosted sales is that what we should advocate? Surely we should embrace all of these things regardless of whether they lead to “success” as measured by a narrow range of financial metrics.

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Biopsying Areas Only Seen or Better Seen with Breast Tomosynthesis

Tomosynthesis is a breast cancer screening and diagnostic modality that acquires images of a breast at multiple angles during a short scan. The individual images are then reconstructed into a series of thin, high-resolution slices typically 1 mm thick.

A tomosynthesis dataset greatly reduces detection challenges associated with overlapping structures in the breast, which is the primary drawback of conventional 2D analog and digital mammography.

By the end of 2015, Hologic, the leader in breast tomosynthesisⁱ, had installed approximately 3,600 breast tomosynthesis systems worldwideⁱⁱ. Many sites using the Hologic tomosynthesis system have purchased Hologic's C-View™ software, which generates a 2D image from the tomosynthesis dataset, avoiding the need for a separate 2D exposure. Eliminating the 2D exposure saves time and makes the dose of a Hologic 3D MAMMOGRAPHY™ exam comparable to the dose of a conventional 2D exam.



The lightweight Affirm upright system easily integrates onto the Hologic tomosynthesis system in under a minute and is pre-programmed to use Hologic's Eviva® and ATEC® biopsy needles



Clinical studies, including the landmark *JAMA* study, “*Breast Cancer Screening Using Tomosynthesis in Combination With Digital Mammography*,” found that Hologic breast tomosynthesis exams resulted in a significant increase in Positive Predictive Value (PPV) for biopsy versus conventional 2D mammographyⁱⁱⁱ. PPV for biopsy is a widely used measure of the proportion of women having a breast biopsy who are found to have breast cancer.

Unfortunately, suspicious areas found with breast tomosynthesis exams may be occult in other imaging modalities (conventional 2D mammography, ultrasound, breast MRI), or better seen with tomosynthesis. There clearly is a need for a biopsy system capable of targeting these hard-to-image areas. That need is answered with the Affirm™ upright and prone biopsy systems from Hologic.

Tomosynthesis targeting capability in an upright biopsy system

In 2014 Hologic introduced the Affirm™ upright breast biopsy guidance system allowing users to target areas only found with 3D MAMMOGRAPHY™ exams. The Affirm upright system with Hologic's 3D Breast Biopsy offered faster targeting, lower dose, and superior performance when compared to conventional stereotactic biopsy systems^{iv}.

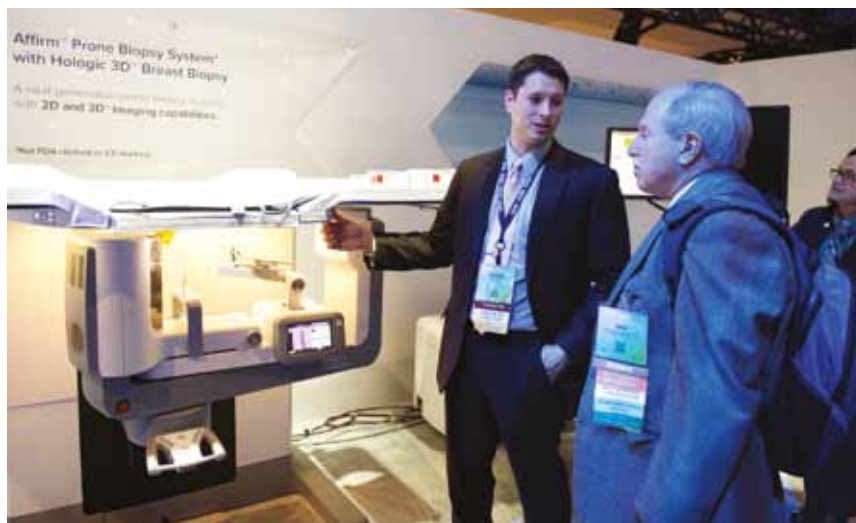
The Affirm upright system is an add-on to the Hologic Selenia® Dimensions® mammography system, allowing the same room to be used for screening, diagnostic and biopsy procedures. Because the biopsy system uses the same imaging platform as the screening system, areas of suspicion seen in a mammography exam are quickly and easily targeted.

ⁱIHS Technology. “Mammography X-ray Equipment - World - 2014 - Version 2.” October 2014.

ⁱⁱHologic 2015 Q4 Earnings Call, November 4, 2015. <http://investors.hologic.com/webcastpresentation#past:2016:1> (accessed January 20, 2016)

ⁱⁱⁱFriedewald S, Rafferty E; Rose S, et. al. “Breast Cancer Screening Using Tomosynthesis in Combination with Digital Mammography.” *JAMA*. 2014;311(24):2499-2507. doi:10.1001/jama.2014.6095.

^{iv}Schrading S, Martine D, Dirrachs T, et. al. “Digital Breast Tomosynthesis-guided Vacuum-Assisted Breast Biopsy: Initial Experiences and Comparison with Prone Stereotactic Vacuum-assisted Biopsy.” *Radiology*. 2015 274:3, 654-662 and Smith A, Sumpkin J, Zuley M, et. Al. “Breast Cancer Screening Using Tomosynthesis in Combination with Digital Mammography.” *JAMA*. 2014; 311(24):2499-2507.



The ability of the Affirm™ prone system to perform both stereotactic and tomosynthesis-guided breast biopsies, attracted considerable interest when it was shown as a work in progress at the Radiological Society of North America Congress in 2015.

Tomosynthesis targeting capability in a dedicated prone biopsy system

During 2016 Hologic is introducing the commercial availability of the Affirm™ prone biopsy system, the first dedicated prone biopsy system capable of both stereotactic and tomosynthesis-guided breast biopsies. The Affirm prone biopsy system is CE marked and pending 510k clearance in the U.S.

The new system complements Hologic's Selenia® Dimensions® mammography system and Affirm™ upright biopsy system to ensure that facilities have all the options necessary to provide minimally invasive breast biopsy to their patients.

The Affirm prone system provides enhanced biopsy performance over existing prone systems with:

- Exceptional biopsy imaging capabilities using the same detector technology as the Hologic tomosynthesis mammography system. → We should not compare, but make it absolute
- A streamlined workflow designed to make using the system fast and easy to use.
- Access to challenging lesion locations with a fully integrated C-arm. The C-arm allows a full 360° access to the breast with both standard and lateral needle approaches—without requiring additional accessory attachments.

The Hologic Affirm™ upright and prone biopsy systems push the boundaries of breast care. With their dual stereotactic and groundbreaking tomosynthesis biopsy capabilities, radiologists can now easily locate and target regions of interest for biopsy, delivering streamlined workflow, accurate targeting and exceptional images.



Third Metric

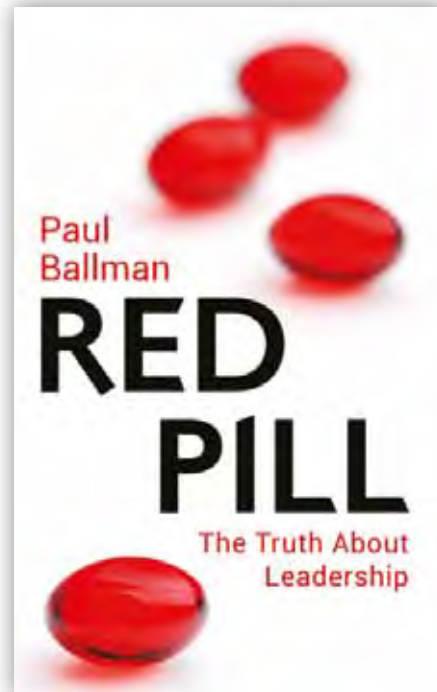
There has been another trend in recent years that has gone some way towards broadening our view of success. In *Thrive*, Arianna Huffington argues that we need to go beyond the currently dominant measure of success, which she sees as being money and power, and instead focus on a third metric (Huffington 2014). Cynics will argue that it is easy for someone with lots of money and power to wax lyrical about a third metric, but at least she is saying it and that can only be good. Huffington's third metric has four pillars: wellbeing, wisdom, wonder and giving. She rightly argues for a life with more balance and humanity and urges us to have a different definition of success. While I applaud such attempts to broaden the definition of success, in some ways I don't think that it goes far enough. We are still focused on behaving some way as a means to an end. It may be happiness rather than money, but it still has the same dynamic.

As an alternative approach, I am tempted to focus on being the leader I want to because it is right, not because it gets me something in particular as a result. As a deep introvert and father of another, I was recently given Susan Cain's excellent *Quiet* by my long-suffering wife. As she discusses the rise of extraversion as a desirable state precipitated by the work of Dale Carnegie (Dale Carnegie Training 2016), she reflects on the evolution of self-help books through the ages:

**“BE THE BEST VERSION OF
OURSELVES...WHILE AT THE SAME
TIME LEADING YOUR BUSINESS IN A
WAY THAT INCREASES ITS CHANCES
OF SUCCESS ”**

“Many of the earliest conduct guides were religious parables, like *The Pilgrim's Progress*, published in 1678, which warned readers to behave with restraint if they wanted to make it to heaven. The advice manuals of the nineteenth century were less religious, but still preached the value of noble character. They featured case studies of historical heroes like Abraham Lincoln, revered not only as a gifted communicator, but also as a modest man who did not, as Ralph Waldo Emerson put it, “offend by superiority”. They also celebrated regular people who lived highly moral lives. A popular 1899 manual called *Character: The Grandest Thing in the World* featured a timid shop girl, who gave away her meagre earnings to a freezing beggar, then rushed off before anyone could see what she'd done. Her virtue, the reader understood, derived not only from her generosity but also from her wish to remain anonymous.

But by 1920, popular self-help guides had changed their focus from inner virtue to outer charm – “to know *what*



to say and *how* to say it,” as one manual put it. “To create personality is power,” advised another. “Try in every way to have command of the manners which make people think ‘he’s a mighty likeable fellow,’” said a third. *Success* magazine and *The Saturday Evening Post* introduced departments instructing readers on the art of conversation. The same author, Orison Swett Marden, who wrote *Character: The Grandest Thing in the World* in 1899, produced another popular title in 1921. It was called *Masterful Personality* (Cain 2012).”

Later, Cain reports that the earlier guides used words like:

- Citizenship;
- Duty;
- Work;
- Golden deeds;
- Honour;
- Reputation;
- Morals;
- Manners;
- Integrity.

While the later guides describe characteristics like:

- Magnetic;
- Fascinating;
- Stunning;
- Attractive;
- Glowing;
- Dominant;
- Forceful;
- Energetic.

While Cain was making a point about introversion and extraversion, I think that she also highlights a trend from being of good character as an end in its own right to simply behaving

continued from p. 18

in a way that is going to maximise your likelihood of success. In a recent book, Fred Kiel tells us that there is a *Return on Character*. He claims that people with his definition of character achieve five times the return on assets than those without (Kiel 2015). Even if his research is correct, then character is still just being packaged as a technique for being successful and so by my definition this is not character at all. True character persists regardless of failure, not simply to earn success.

When I talk to people outside of the work context, I think that most of the world does still value character in its own right. I would love to be seen as a good man, as a man of integrity and I am sure I am not alone in this desire. I am also not alone in failing at times to meet that aspiration. But somehow in the world of business the dialogue so easily turns to success as the ultimate measure. We can recognise leaders who succeed and happen to be good, but we are equally in awe of those who just succeed. There is precious little narrative of those who are good even though circumstances led to failure. The interesting thing for me is that by doing all the right things I can influence, but not control, my success. On the other hand I can entirely control whether or not I act with integrity. I will try my best to succeed, but if I fail I at least want the consolation that I didn't lose my principles along the way.

I am encouraged that many noble behaviours can lead to success, but we must acknowledge that they can also fail. Likewise some morally questionable activities might get you



the results you want. So perhaps you should ask yourself what kind of leader you want to be independently of whether it leads to success. If we could learn to value character as much as we do success, might that not be a better way to live? We should not be afraid to put morality above success and act accordingly. Ed Catmull puts it well:

"I know one gaming company in Los Angeles that had a stated goal of turning over 15 percent of its workforce every year. The reasoning behind such a policy was that production shoots up when you hire smart, hungry kids straight out of school and work them to death. Attrition was inevitable under such conditions, but that was okay, because the company's needs outweighed those of the worker. Did it work? Sure, maybe. To a point. But if you ask me, that kind of thing is not just misguided, it is immoral," (Catmull).

To close, let me reassure you that I am not in any way against success. I like it very much. However, I know that it is a hard thing to guarantee, and anyone who tells you they have the answer is mistaken. I also know that it is not the most important thing in the world. Being able to live with myself and the way I have behaved is. Let us attend to how to be the best version of ourselves, the people we want to be, while at the same time leading your business in a way that increases its chances of success (however defined) without necessarily being able to guarantee it. ■

Key Points

- ✓ Conventional preoccupation with success creates barriers to true leadership.
- ✓ Relying on financial success as justification for ethical behavior undermines it.
- ✓ Need to focus on character as an end in it own right, not a means to an end.



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HEALTHCARE LEADERSHIP CRISIS

THE CANADIAN SOLUTION



Graham Dickson

Professor Emeritus
Royal Roads University
Victoria, British Columbia
Canada

Graham.Dickson@RoyalRoads.ca



David Koff

Professor and Chair
Department of Radiology
McMaster University
Hamilton, Ontario
Canada

HealthManagement
Editorial Board Member

dkoff@mcmaster.ca

Healthcare, a Changing Landscape

Equal access to a quality healthcare system is part of the Canadian Charter of Rights and Freedoms (1982), and is considered as a right by Canadians. Making Canadians the healthiest people in the world as well as preserving a healthcare system that is true to their values and sustainable must be the system's overriding objective (Royal Commission on the Future of Healthcare in Canada 2002). In 2007 the Lewis and Romanow report identified four priorities that the healthcare system had to address urgently:

- Waitlist management;
- Fiscal sustainability;
- Primary care reform;
- End-of-life care (Dickson 2008).

However, in 2014 the Commonwealth Fund reported that Canada's healthcare system ranked 10th out of 11 developed countries, mainly due to safety, timeliness and efficiency of care (Davis et al. 2014).

A *Report on Canadian's Expectations of the HealthCare System*, released at the National Health Leadership conference in June 2015, revealed that 70% of Canadians are very worried about being excluded from the system, especially when it comes to critical areas such as mental health, care of seniors, palliative care and hospital safety (HealthCareCAN 2015).

With an ageing population and finite financial resources, it is more than ever urgent to implement the steps required to bring Canada back into the top five in the next five years. A Call to Action issued at the Leadership conference identified as a key priority the need for better leadership by healthcare providers, as this is the first enabler of better health system performance and better organisational performance. It starts with individual leadership based on the needs of patients. It also means senior healthcare leaders working better together to plan and organise healthcare systems for the future.

In 2004 the Province of British Columbia identified the leadership gap in healthcare and called for new leadership skills in the healthcare system. The Health Care Leaders' Association of British Columbia (HCLABC) joined forces with the Centre for Health Leadership and Research at Royal Roads University to define the concept of strategic leadership for healthcare reform. This resulted in the creation of *Leaders for Life* in 2006 and the introduction of the LEADS framework, the result of an action research study led by Professor Graham Dickson in October that year. *LEADS in a Caring Environment* rapidly gained national recognition and was endorsed by the Canadian Health Leadership Network (CHLNet) (chlnet.ca) and the Canadian College of Health Leaders (cchl-ccls.ca) in

2009. That consortium of LEADS-based partners has grown to include most national health organisations, whole provinces, and multiple health agencies and or institutions in all provinces in Canada by 2016.

Leadership Crisis

Leadership has been identified as the single most important factor in the success of any enterprise. As stated by the Logan Arts Leadership Institute, "Real leadership is a precious commodity, and it is in increasingly short supply..." (interlochen.org/LoganArts).

The current leadership low supply crisis is primarily caused by a massive retirement bulge of "baby boomers" and lack of succession planning. Healthcare institutions are under pressure to improve performance, safety and quality, which means major transformation in their operational models. More and better leadership as performing now is not enough anymore. In 2007 the Conference of Deputy Ministers of Health in the Pan-Canadian Health Human Resource framework acknowledged as a national priority the need for stronger leadership to attract and retain highly qualified people to work in healthcare (Federal/Provincial/Territorial Advisory Committee on Health Delivery and Human Resources 2007).

Boosting Leadership Capacity

There are two ways to achieve stronger leadership capacity:

- **Increase the Quantity** (widespread): moving away from the old model of top-down leadership, this is the concept of distributed leadership, where more people at all levels will provide leadership, with widespread leadership accountability. However, this assumes the implementation of an extensive infrastructure for leadership development to build capacity.
- **Improve the Quality** (upgraded): this model requires enhancing the skills of leaders and helping them to acquire a set of competencies to become powerful through influence rather than authority, and strategic in understanding and implementing the organisational vision and priorities, in order to achieve the transformation required by the system.

Both strategies must be developed in conjunction, as they complement each other.

Leadership versus Management

It is common to see confusion between leadership and management. Both are often addressed under the same banner, mainly in business school programmes. But they must be clearly differentiated:

- **Leadership** is the visionary quality required to drive change in a complex environment, that will set the direction and strategy expected by the group. A leader is expected to innovate, inspire trust and challenge the status quo.
- **Management** relies on a set of knowledge and skills required to organise, plan, evaluate and control when the direction has been defined. A manager is expected to administer, rely on control and accept the status quo.

The LEADS Framework

The LEADS framework (leadersforlife.ca/site/framework) represents the key skills, abilities and knowledge required to lead at all levels of an organisation. It aligns and consolidates the leadership strategies and competency frameworks found in Canada’s healthcare sector. The guiding principle behind LEADS is that leadership soft and hard skills can be defined and developed in order to increase the number and quality of leaders. The LEADS framework is simple, complete, portable, and can be applied to all levels.



Image credit: Graham Dickson

Figure 1. The Five Domains of the LEADS Framework

“A LEADER IS EXPECTED TO INNOVATE, INSPIRE TRUST, CHALLENGE THE STATUS QUO”

There are five domains in the LEADS framework (**Fig. 1**):

1. Lead Self;
2. Engage Others;
3. Achieve Results;
4. Develop Coalitions;
5. Systems Transformation.

The domains interact with one another to create effective leadership and accomplish change (**Fig. 2**). Each domain is composed of four capabilities. Capabilities differ from competencies in the fact that they are organic, evolve and develop over time and are unique to each individual.

1. Lead Self

- Self-aware:* leaders must recognise their own emotions and the impact they may have on others. They must be aware of their perceptions and assumptions, as well as of the values and principles which will guide their decisions.
- Manages self:* leaders must demonstrate emotional self-control, initiative and optimism. Maintaining life balance is important, as leaders must be well equipped to deal with challenges.
- Demonstrates character* is composed of two major attributes: personal integrity and emotional resiliency, key to successful leadership.
- Develops self:* leaders must develop soft skills, such as confidence and social intelligence. Every experience must be an opportunity for lifelong learning.

2. Engage Others

- Foster development of others:* a good leader must recognise and reward the work and effort of others, coach, teach and encourage learning. The leader must deal with inappropriate behaviour.
- Contribute to the creation of healthy organisations,* in building trust, promoting safety, service and quality and ensuring resources are available for people to perform effectively.
- Communicate effectively,* starting with being a good listener, and use different communications media to convey a clear message. It is not uncommon for leaders to display poor communication skills and to assume that people will guess what they have in mind.
- Build teams,* in encouraging participation from stakeholders and finding ways to use people’s strengths. But priority must be given to articulate clearly the vision and goals.

3. Achieve Results

- Set direction:* a key role for a leader is to build a compelling vision for the future with clearly defined outcomes, and communicate this vision in an effective way, which is the only way to get commitment from those who need to be part of the plan moving forward.
- Strategically align decisions with vision, values and evidence;* this is not an easy task, taking into consideration the complexity of our healthcare system. We need to respect multiple factors such as culture, structure and personal skills.
- Take action to implement decisions,* with an absolute focus on results. The leader must command, but at the same time must be able to delegate and let go of the details.

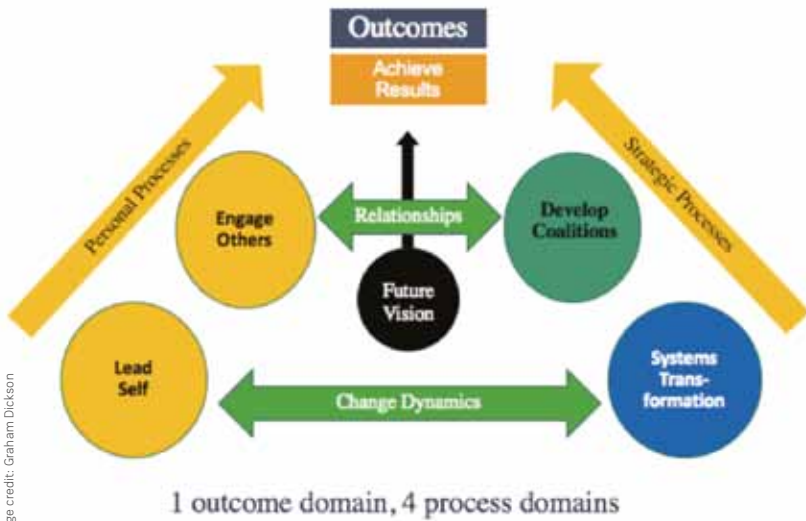


Image credit: Graham Dickson

Figure 2. LEADS as a Model for Change: One Outcome Domain, and Four Process Domains

d. *Assess and evaluate*: people must be accountable to standards of performance. Based on accurate data collection, the leader must use tools such as balanced scorecard or logic models to measure performance and achievements, and course correct if needed.

4. Develop Coalitions

- a. *Purposefully build partnerships and networks to create results*: once the goals and objectives are clearly defined, choose the right partner and identify the right form of collaborative structure, built on trust and reciprocity, sharing risks and benefits.
- b. *Demonstrate a commitment to customers and service*,

and ensure that all partners remain true to the value proposition, in order to achieve desired outcomes. The caring purpose must be kept at the forefront, benefits to patients or citizens must be defined, and the coalition must measure progress to course correct along the way.

c. *Mobilise knowledge, using the “five As” strategy*: ask the right question, acquire the right information, assess the reliability of that information, adapt or repackage that information as necessary, and apply the evidence strategically.

d. *Navigate sociopolitical environments*: requires the leader to be politically astute, which means understanding threats and opportunities, being aware of key players and treating others with respect; the leader must build emotional resiliency to be able to negotiate through conflicts and mobilise support, handling uncertainty with confidence and influencing resistant partners to support a solution.

5. Systems Transformation

a. *Demonstrate systems/critical thinking*: of course, the leader must understand the pressing issues within our complex health system, challenge the status quo, and design and implement the process which will lead to systems transformation.

b. *Encourage and support innovation*, as this is the engine of creativity and can lead to success through evidence-based approaches.

c. *Orient themselves strategically to the future*: the leader is expected to be the visionary, conscious of trends and issues, able to shape the future.

d. *Champion and orchestrate change*: this is the ultimate goal, where the leader has accomplished all the steps required to improve the health system performance and has aligned all the elements to execute change.

Key Points

- ✓ Leadership is the single most important factor in the success of any enterprise.
- ✓ Better leadership is the first enabler of better health system performance.
- ✓ Leadership can be practised at all levels of the organisation.
- ✓ LEADS provides 5 domains and 20 capabilities to frame leadership.
- ✓ Leadership is a lifelong learning experience.

Conclusion

The Canadian healthcare system is in crisis, and requires major transformational changes to adapt to limited financial resources and an ageing population. Achieving this transformation means leadership at all levels, and leadership is a precious resource in short supply. We need to train more leaders, and *LEADS in a Caring Environment* (Dickson and Tholl 2014) has been designed to help healthcare professionals to acquire the soft and hard skills they need to implement all the steps required to achieve results and transform the current system. Leadership is an exciting journey and a lifelong learning experience, which must be practised at all levels of the organisation. ■



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LEADS Collaborative leadscollaborative.ca

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ENTREPRENEURIAL DOCTORS



Lucie Robson

Senior Editor
HealthManagement.org
lr@healthmanagement.org
@ehealthmgmt

They say that necessity is the mother of invention and nowhere is this truer than in the trend for medical professionals turned entrepreneurs in the aim to present a workable solution to obstacles they encounter in their practices.

Medical entrepreneurship, particularly in the IT field, is widely supported by both peer groups, government agencies and hospital innovation departments as the race to exploit technology for the benefits of medics and patients gains momentum.

As with most inventions that resonate widely and become successful, many ideas that doctors turn into marketable products and services have their roots in their daily professional experience.

"I have seen firsthand how difficult it can be for patients to remember the information and instructions I shared during our visits – especially with topics that are complicated and discussions that are emotionally charged," Dr. Randall Porter, one such entrepreneur and founder of The Medical Memory told *HealthManagement.org*. Dr. Porter's company provides a simple and convenient mobile app for video-recording in-person medical conversations and one-way doctor-to-patient messages, as well as a secure website where patients can watch those videos and share them with caregivers.

"However, I had never experienced the problem personally until 2003, when my father was diagnosed with prostate cancer. He was a very intelligent man – he had a PhD in Economics from University of Chicago – but even he had a difficult time remembering and understanding his doctor's instructions and prognosis. It was hard to see him struggling to share that information with my mother and me."

Dr. Porter took to calling his father's doctors to get more information, knowing this could be a time drain for both parties – particularly when they were repeating information they had already shared.

"Knowing that the same problem existed in my own practice, in 2008 I decided to try something new. I would video-record all of my patient visits and share the recordings with them. I used a small HD camera and gave them DVDs at the end of each appointment so they could review our conversation at home. My staff and I saw an immediate improvement in the level of recall patients had with their diagnoses and treatments."

Recognising how his idea met wider needs, in 2012, Dr. Porter entered a partnership with a colleague, Lucas Felt, now cofounder and president of The Medical Memory. Together they turned his initial idea of recording visits for better care into an actual product, with a much more effective and streamlined recording and sharing workflow.

Dr. Porter's advice to medics who have an inkling they have an idea that could help any part of the continuum of care is to observe where staff and patients are most uncomfortable.

"My first piece of advice is to always pay attention to pain points your staff and patients are experiencing. They will communicate what they need both verbally and nonverbally. It is your job as an entrepreneur to be in tune with their needs."

He knew his patients had problems with information retention because of the number of post-visit phone calls his office received from them and their caregivers asking to clarify discussions he had just had.

"Instead of accepting their confusion and my staff's unnecessary workload as facts of life, I worked to solve the problem."

Medical entrepreneurship is widely recognised, supported and monitored by industry groups, NGOs and governments.

Doctorpreneurs, a UK-based global community of more than 1,000 medical professionals, students and those who are interested in innovation in healthcare, launched in 2011 in order to provide networking for technology entrepreneurship. It is run by a team of doctors and medical students connected with a network of industry experts. Events include surgeries on the reality of starting up a healthcare company and in 2014, they moved on to the next step. “With healthcare facing unprecedented challenges globally, we believe that the wealth of talent already within the system will be key to driving radical change. We support doctors, medical students and other individuals to think creatively and embrace principles of innovation and entrepreneurship to improve healthcare. Recognising the importance of ‘learning from experience’, we have retained a focus on interviews with experienced entrepreneurs, and also sought out opportunities to help community members actively get involved and start their entrepreneurial journey.”

With a proliferation of healthcare apps, monitoring and controlling the quality of mHealth is top of the agenda for the European Commission. It has set up a working group to develop guidelines for assessing the validity and reliability of the data that health apps collect and process. Based on their expertise, 20 members representing civil society, research and industry organisations were selected to participate in the working group. The guidelines are expected to be published by the end of this year (Digital Agenda for Europe 2016).

Protecting the interests of app developers “as creators, innovators, and entrepreneurs” and with offices in Washington, London and Brussels is The Apps Alliance, serving as a trade association for more than 50,000 members. “The mission of the Alliance is to serve as an advocate for developers, support the industry’s continued growth, and promote innovation. Today, the Apps Alliance is working to provide a global and centralised platform that recognises and values developers as an essential workforce” (Application Developers Alliance 2016).

“PAY ATTENTION TO PAIN POINTS YOUR STAFF AND PATIENTS ARE EXPERIENCING. IT IS YOUR JOB AS AN ENTREPRENEUR TO BE IN TUNE WITH THEIR NEEDS”

Entrepreneur, Dr. Randall Porter

may be hard to grasp, there are firm arguments that the two pathways have more in common than might first meet the eye. The decisive judgment involved in the medical profession is akin to that of business, research and experimentation is characteristic of both fields and dealing with uncertainty is routine (Meyers 2013).

The big question going through many medics’ minds who are considering taking a chance on a unique idea, is funding. What options exist for a good idea to move from mind to matter? The answer is that there is no single route for taking inspiration to the next step. In Dr. Porter’s case, the initial stages were self-funded.

“For a couple of years, we were completely bootstrapped; meaning we didn’t seek any outside funding or investment, and we used our own money and resources to build out the platform, which we later supported with some modest ‘friends and family’ investment. While we had a lot of success with that model, we needed more significant outside funding once the product was far enough along for us to accelerate growth and expand nationally.”

So, last year, Felt and Dr. Porter secured funding of U.S. 2.1 million dollars, led by a venture capital firm out of Boston, and they are using the capital to further develop the platform, expand the service offering and roll out sales efforts nationally. The product has 197 providers in more than 40 offices recording videos in 30 states, and the videos have been shared with caregivers in 48 states to date.

“Perhaps more important than growth though, is the data that shows the app’s effectiveness, with an overwhelmingly positive response from doctors, patients and administrators.”

While Dr. Porter has been delighted with how his idea has met a real need and market penetration is growing, he says he will always consider himself to be a doctor first and foremost.

“I will always be a surgeon first and I am in surgery throughout the week. I continue to have new ideas, but they are all focused on all things related to doctor-patient communication. Some get in our product development line-up right away, others are for later down the road.” ■

Partnering with an expert in product development is also key to success.

“I would also say that few working doctors can do it on their own. While we’re uniquely qualified to understand the pain point and to figure out a solution, it takes someone with skills in operations, product development and sales to create a real company. Without my cofounder I’d still just be recording to memory cards.”

While marrying the idea of a medic whose prime concern is caring for patients with the business of entrepreneurship



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TEAMS IN HEALTHCARE



The high-performing team is ... an essential tool for constructing a more patient-centred, coordinated, and effective health care delivery system.

Source: Mitchell P, Wynia M, Golden R et al. (2012) Core principles & values of team-based health care. Washington: Institute of Medicine. <https://iii.hm/29f>



“ A team is a group of individuals who work together to produce products or deliver services for which they are mutually accountable. The team members share common goals and rely on each other to achieve them. Because the team holds itself collectively accountable, the work of integrating with one another is included among the responsibility of members. ”

Source: Royal College of Radiologists and Society and College of Radiographers (2012) Team working in clinical imaging <https://iii.hm/29c>

5 PRINCIPLES OF TEAM-BASED HEALTHCARE

1
Shared goals

2
Clear roles

3
Mutual trust

4
Effective communication

5
Measurable processes and outcomes

Source: <https://iii.hm/29f> - p.6.

WHAT MAKES A TEAM EFFECTIVE?

An effective team is one where the team members, including the patient, communicate with one another, as well as combining their observations, expertise and decision-making responsibilities to optimise care



Source: World Health Organization (2012) Being an effective team player. <https://iii.hm/29d>

THE POWER OF OBJECTIVES

The clearer the team's objectives - the higher the level of participation in the team - the higher the level of commitment to quality - the higher the level of support of innovationthe more effective, the more innovative are health care teams across virtually all domains of functioning.

Source: Borrill C, West M, Dawson J et al. (2006) Aston OD. Team working and effectiveness in health care. <https://iii.hm/29e>

HOW NOT TO BUILD A TEAM

- Building plans without consultation
- Autocratic leadership
- Failing to value diversity
- Springing ideas on others without discussion

Source: NHS Leadership Academy (2015) Engaging the team – healthcare leadership model dimensions. <https://iii.hm/29g>

INTERDISCIPLINARY TEAM COMPETENCIES

1	Identifies a leader who establishes a clear direction and vision for the team.
2	Incorporates a set of values that clearly provide direction for the team's service provision.
3	Demonstrates a team culture and interdisciplinary atmosphere of trust where contributions are valued and consensus is fostered.
4	Ensures appropriate processes and infrastructures are in place to uphold the vision of the service (for example, referral criteria, communications infrastructure).
5	Provides quality patient-focused services with documented outcomes; utilises feedback to improve the quality of care.
6	Utilises communication strategies that promote intra-team communication, collaborative decision-making and effective team processes.
7	Provides sufficient team staffing to integrate an appropriate mix of skills, competencies, and personalities to meet the needs of patients and enhance smooth functioning.
8	Facilitates recruitment of staff who demonstrate interdisciplinary competencies including team functioning, collaborative leadership, communication, and sufficient professional knowledge and experience.
9	Promotes role interdependence while respecting individual roles and autonomy.
10	Facilitates personal development through appropriate training, rewards, recognition, and opportunities for career development.

Source: Nancarrow SA, Booth A, Ariss S et al. (2013) Ten principles of good interdisciplinary team work. Hum Resour Health, 11: 19. <https://iii.hm/29h>

LEADERSHIP GOLD



5 TEAM MEMBER VALUES

Characteristics of the most effective members of high-functioning teams in health care.

- CREATIVITY
- HONESTY
- DISCIPLINE
- CURIOSITY
- HUMILITY

Source: <https://iii.hm/29f> - p.5.

5 TIPS FOR LEADERS

- 1 Recognise talent and know how to keep it
- 2 Understand that change equals opportunity
- 3 Realise that healthcare is a business
- 4 Prioritise excellent customer service
- 5 Communicate a vision

Source: George Washington University Online Healthcare MBA program. <https://iii.hm/29i>

LEADERSHIP

Clear leadership involves **creating alignment** amongst team members around **shared objectives**, and **strategies** to attain them; increasing **enthusiasm** and **excitement** about the work, and maintaining a sense of **optimism** and **confidence**; helping those within the team **appreciate** each others' **contribution** and helping them to **learn** how to **confront** and **resolve differences** constructively; helping people to co-ordinate activities, and **continuously improve**; helping them to **develop** their capabilities and encouraging **flexibility**; and offering objective **analysis** of processes and encouraging **collective learning** about better ways to work together.

Source: Borrill C, West M, Dawson J et al. (2006) Aston OD. Team working and effectiveness in health care. <https://iii.hm/29e>



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BIG DATA AND ANALYTICS IN HEALTHCARE

X-ray, computed tomography, blood tests, genetic diagnostics, health apps and wearables: we are producing a whole host of health-related data. What opportunities and risks do “Big Data” provide for patients and their care?



Mathias Goyen

Professor of Diagnostic Radiology, Hamburg University
 Chief Medical Officer Oncology GE Healthcare
 HealthManagement Editorial Board Industry Advisor
 mathias.goyen@ge.com



After increasing importance in the financial industry, logistics and production, Big Data and analytics have rapidly started to gain momentum in healthcare as well. The potential of this emerging, IT-driven wave of innovation is huge. Big Data is supposed to make medicine more affordable and better. Data transparency and analysis are the drivers towards value-based medicine, where the basis of payment is not the resulting medical expense, but the success of treatment for the individual patient.

Much hope is associated with Big Data in medicine: reduced treatment costs, shortened hospital stays, enabled or optimised individualised therapy plans and combatting submission of false claims. Accordingly, the market potential is huge. The Big Data and analytics market in the U.S. is valued at \$80 billion for the year 2020 (SNS Telecom 2015). These prospects are increasingly drawing in companies such as Google, Apple, IBM or Salesforce in addition to medical technology companies native to the healthcare market. It will be fascinating to

see whether and how these new players assert themselves in the jungle of healthcare systems.

Drivers of “Big Data” in Medicine

The explosion of “Big Data” in medicine is based on three factors:

1. Exponential growth of digitised information: due to the increasing digitalisation of formerly analogue media (images, reports, lab results, etc.) as well as the continuous optimisation of diagnostic laboratory and imaging sensors. Cutting-edge CT systems allow the recording of several thousand projections in only 1 second. Within 10 seconds, the entire body is depicted in 2mm thin layers. Add to this new patient data such as imaging data or molecular or genetic information. Furthermore, growing amounts of data are generated by increased monitoring with sensors of all kinds. Such monitoring is by no means limited to patients any longer, but also encompasses healthy people in ever greater numbers. Smartphones, activity trackers such as Fitbit and so on continuously produce huge floods of data. Correspondingly structured, semi-structured and unstructured data from a variety of sources coexist today, which jointly constitute “Big Data”.

2. The biological processes underpinning modern medicine are increasingly better understood in their heterogeneity. The cause of this improved understanding is the deciphering of the human genome, through which genetics determines whether and how people respond to different therapies. The associated differentiation is the basis of individualised medicine, to which prognostic risk stratification is inherent. Diagnosis and treatment are thus growing exponentially complex, and increasingly overwhelm any given physician. Big Data analytics are needed to filter out relevant, differentiating information from the resulting flood of data and, based on this, to help make correct, individualised treatment decisions.

3. The technological development of cloud-based IT solutions has cleared important thresholds in several key areas. Cloud computing allows data from different sources and of different quality, modality and structure to be technically unified into a whole “Big Data”. Transparency and networking coupled with mobility make data available independently of time and space. Moreover, available data are useful for the development of novel algorithms (eg, closest neighbour analysis, deep machine learning). This in turn allows conclusions to be drawn for individual patients (decision support) as well as for whole populations (population health).

Big Data Challenges

Together, the above-described drivers are causing an explosion of “Big Data” in medicine. However, there are also significant challenges. Technically, it is important to master the three “Vs” in the domain of Big Data: huge amounts of data (volume), great variety of data (variety) and high speed of

data generation and processing (velocity). In this regard, technical development is making rapid progress.

Apart from technical challenges, there are other challenges that hinder the development of Big Data in medicine. Of these, the issue of data security certainly takes up the biggest space. Any health cloud has to meet specific standards of safety and protection. There are two aspects to data security in cloud computing: first, the so-called security of personal data and secondly, the security of corporate data from unauthorised access or from loss. European Union-wide or global standards need to be developed here.

Big Data Potential

Big Data harbours enormous opportunities, which build upon one another in cascading fashion (**Fig.1**).

1. Dashboard / transparency:

Big Data technologies combine different data sources and create transparency by sorting unstructured data. Thus relationships are visualised, which improves the quality of medicine at the same time as reducing costs. This networking is not limited to hospital or physicians’ practice data. Rather, even patient-specific data from sensor watches such as pulse, blood pressure or blood sugar can be wirelessly transmitted and analysed in real time. Without delay, abnormalities in

the readings can be identified and corrective action taken in this way. Most applications of Big Data are currently at this stage.

2. CAD: Computer-Assisted Detection

Computer-assisted detection (CAD) combines elements of artificial intelligence and of digital image processing with radiological imaging. The typical field of application already is tumour diagnosis, especially breast and lung diagnosis. CAD supports screening mammography, which has been employed for the early detection of breast cancer for many years. CAD, established mainly in the U.S. and the Netherlands, serves diagnosticians as a second opinion to their own analysis. In lung cancer diagnostics, computed tomography (CT) has established itself as the gold standard, thanks to special three-dimensional CAD. Here, a volumetric data set of up to 3,000 individual images is processed and analysed. Nodules (outbreak, metastases and benign changes) can be detected from 1mm in size. Thus the strain on physicians is relieved and cognitive errors are reduced.

Big Data technologies go one step further. Deep machine learning can automate the evaluation of all image data. Deep learning arranges neural networks on to planes that use increasingly complex features, such as to recognise the content of an image. Thus masses of data can be sorted into categories. These networks, consisting of electronic nerve cells and the connections between them, are not explicitly programmed but trained using examples. It is only recently that the technology has become capable of simulating really complicated networks on the computer. With vast amounts of data, they can be trained.

“BIG DATA AND ANALYTICS CAN ALREADY POINT TO IMPRESSIVE RESULTS IN THE MEDICAL FIELD, BUT DEVELOPMENT IS IN ITS INFANCY”

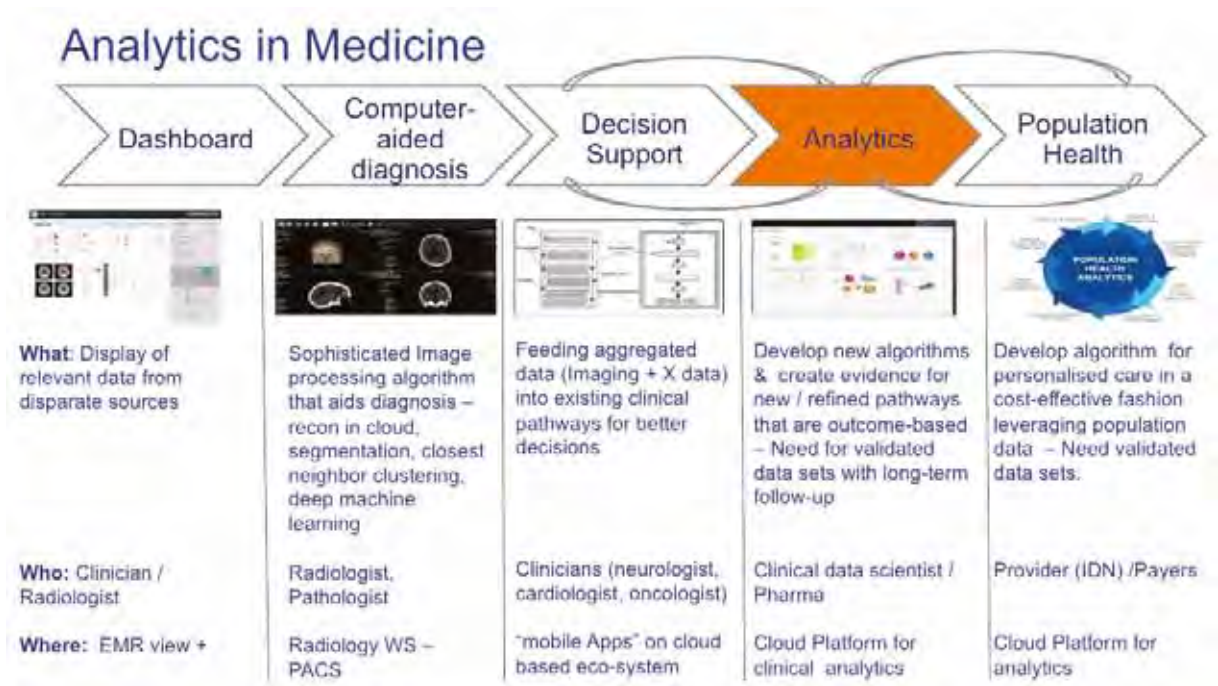


Figure 1. Analytics in Medicine

EMR Electronic medical record IDN Integrated delivery network PACS Picture archiving and communication system WS Workstation

The fascinating results of deep machine learning are known: The IBM computer Watson, a semantic search engine that captures questions asked in natural language and finds appropriate facts and answers in a big data database in a short time, has not only beaten the human champion of the quiz show Jeopardy!, but is now also making medical diagnoses (IBM Watson n.d.). Now WATSON is learning how radiographs are diagnosed (IBM 2015). The first step is to differentiate between normal and pathological findings. This is followed by the structured analysis of abnormal findings that lead to a diagnosis. This technology will fundamentally change the reporting of all image data in radiology, pathology, and all other medical fields. Although the "Google Brain" can already simulate around 1 million neurons and 1 billion connections (synapses) (Dean and Ng 2012), we are currently only at the very beginning of this exciting technological development.

3. Decision Support

Decision Support Systems (DSS) are software systems in medicine that are employed in hospital settings as instruments of knowledge management. They build on a knowledge base (of existing clinical pathways) maintained by experts and are able to autonomously reach conclusions, assessments

and solutions of certain problems in complex treatment processes. They represent the next evolutionary stage of Big Data in medicine.

Expert systems are designed and implemented in such a way that they are integrated into existing hospital information systems in order to not only manage the information

therein but also work independently with them. The need for this arises in situations where physicians have to rely on selecting and consultative end support in their daily medical decision-making processes, due to the increasing complexity of various treatment options. The set of rules for DSS systems is based on, eg, guidelines adopted by professional bodies, so-called clinical pathways.

Expert systems select and structure information along these pathways for specific treatment situations, thereby increasing the safety of patient treatment.

4. Analytics: "Data Mining turns Big Data into Smart Data"

After the capture, storage, visualisation and analysis of data, Big Data allows further analysis as a next step, by using cohort data to correlate various therapies as "inputs" with various "outcomes". What is crucial in this respect is the availability of validated data sets with well-documented patient histories. The right retrospective conclusions on the best

“ DEEP MACHINE LEARNING CAN AUTOMATE THE EVALUATION OF ALL IMAGE DATA ”

therapeutic option can only be drawn with known outcomes, which require millions of records for statistical evaluation. The resulting correlative framework is enriched continuously through enrichment with new patient histories. The result is a self-optimising learning system.

The therapy optimisations that are identified based on such analysis then find their way into DSS systems. Clinical pathways are constantly being adapted to the latest findings. Thus, it is possible to develop improved algorithms and modify existing clinical care pathways. Optimal treatment is identified for newly diagnosed patients based on all available data.

Simultaneously, the analysis provides evidence regarding cost-effectiveness, by correlating outcomes with the cost of therapies. This is the basis of population health.

5. Population Health

Population health is about the optimal use of financial resources for maximum health for a larger cohort. Building on networking, storage and analysis, Big Data analytics provides the instruments to control healthcare services with the aim of optimising outcomes for an entire cohort. Lessons learnt in this way are fed back into the design of individual patient pathways, thus enabling cost-effective use of medical therapies.

In Germany, population health evaluations are only just starting out. The National Cohort is a long-term study, funded by the Federal Ministry of Education and Research, which is running over a period of 20 to 30 years (German National Cohort Consortium 2014). 200,000 randomly selected participants aged 20-69 years from all over Germany will be medically examined and asked about lifestyle habits. In addition, blood samples are taken for all study participants and stored for later research projects in a centralised biobank. The aim is to acquire profound knowledge in terms of prevention and early detection of typical widespread diseases.

In the U.S., however, population health studies are already

being employed by insurers today. Cohort studies from Finland and the U.S. have shown that the occurrence of type 2 diabetes in high-risk individuals (impaired glucose tolerance) could be lowered by more than half over an average period of three years through lifestyle interventions (eg, reduction of excess weight, exercise). It will be crucial that, apart from costs, the outcome of treatment is adequately considered.

“THE RIGHT RETROSPECTIVE CONCLUSIONS ON THE BEST THERAPEUTIC OPTION CAN ONLY BE DRAWN WITH KNOWN OUTCOMES”

Summary

Big Data and Analytics has become a top issue in the healthcare industry.

The trend in medicine is moving from

reactive treatment towards predictive and preventive medicine. Through early intervention, disease is to be prevented, or at least treated early and in an individualised way. The paradigm shift from generalised to individual, personalised medicine will help patients and reduce costs in the healthcare system.

Big Data and analytics can already point to impressive results in the medical field, but development is in its infancy. If it becomes possible to satisfactorily solve data protection issues in addition to technical challenges, broad societal acceptance of Big Data and analytics in healthcare can be expected. ■



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OPPORTUNITIES TO BUILD A BETTER CARE CONTINUUM

FROM GLOBAL TO LOCAL



Alison Lightbourne

Policy Manager
International Alliance of
Patients' Organizations
London, UK

alison@iapo.org.uk

iapo.org.uk

@IAPVoice

For staff working at the sharp edge of health services, whether in a hospital or community setting, what happens at the United Nations (UN) or World Health Organization (WHO) can seem far removed and rather irrelevant. I would encourage you to keep in mind that in the context of delivering a truly patient-centred continuum of care, the recent agreement by 193 countries to sign up to the United Nations Sustainable Development Goals commits these nations to establish and improve universal health coverage for their citizens by 2030 (United Nations 2015). Universal health coverage means healthcare is available to all people who need it - throughout the continuum of promotive, preventive, curative, rehabilitative and palliative health services and that services are effective and safe, and affordable.

A healthcare continuum can no longer be a 'nice to have', but a specific goal that all United Nations (UN) member states will soon need to monitor and report against.

By placing the care continuum firmly at the heart of global health goals, WHO reinforces its importance. More crucially, it means that all of us committed to improving healthcare quality, access, effectiveness and efficiency now have an opportunity to monitor implementation and to hold health systems to account in every country.

A high-level goal can stimulate change, but will not succeed on its own. Local improvements to care can make a difference for patients right now. A 'care continuum' for patients can often feel like a game of snakes and ladders where you never know whether you can safely advance or what risks await that may derail your wellbeing. For other patients, who have a myriad

of conditions to deal with and a linear care continuum from every health service they interact with, it can feel more like a spider's web in which they become entangled. At the local, community, national and global level there is growing recognition that in delivering healthcare, the care continuum needs to cross specialty lines, and not stay purely within the boundaries of traditional 'health' or 'health and social care' services.

From the more informal starting point for the care continuum, patients need to take responsibility through increasing health literacy and building knowledge about their conditions to the extent they are able through optimal use of medicines and treatments. Patients also need to be supported to take preventive and self-management action. This support may come from health professionals, friends and family, social media and other internet-based resources, or other groups in the community. Their health can also be supported through good workplace practices and environmental management. Here we see how many other factors can influence health, wellbeing and health outcomes, even in the very first steps along the care continuum.

When a patient begins to access hospital or community care services for a particular condition, the greatest chance for improved quality of life and outcomes is possible with a holistic approach to treatment. Too often, treatment is narrowly focused on responding to minor ailments, chronic and long-term conditions, serious acute conditions and extended or palliative care. As more and more patients have numerous and interacting conditions, the patient journey to navigate multiple health services throughout their lives becomes ever more complex, particularly when you consider that the 'care continuum' is just one part of a patient's life path and experience that must be negotiated. Despite many efforts, health services are still challenged by the practical delivery of integrated or joined-up services and support, despite good intentions in many countries over past decades.

By genuinely engaging and respecting patients' views at all stages, healthcare professionals can recognise that for patients to achieve the best possible quality of life, healthcare must support patients' emotional requirements, and consider non-health factors such as education, employment, home and family or other issues which impact on their approach to healthcare choices and management.

To us at the International Alliance of Patients' Organizations (IAPO), and our 250 member patient organisations worldwide, the essence of a care continuum is a healthcare system designed for, and delivering, genuinely patient-centred healthcare at every level, and always striving for improvement and more effective collaboration. ■

Key Points

- ✓ A 'care continuum' for patients can often feel like a game of snakes and ladders where you never know whether you can safely advance or what risks await that may derail your wellbeing.
- ✓ To ensure treatment responds to increasingly complex health needs, the care continuum must consider the 'whole patient' beyond traditional specialty and healthcare boundaries.
- ✓ The World Health Organization and all United Nations member states call for universal health coverage, which includes the full care continuum.
- ✓ Patients and their healthcare team can advocate together at the national level for care that better meets patients' needs, and local changes are also crucial.



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THE AFFIDEA EFFECT

A GLOBAL DOSE DATA MANAGEMENT SYSTEM



Dr Rowland Illing

Chief Medical Officer, Affidea
rowland.illing@affidea.com
affidea.com

As the biggest independent provider of advanced diagnostic imaging services in Europe, Affidea owns and operates 170 medical centres and grows at a rate of (on average) one new centre every fortnight.

As the company evolves, our owners Waypoint Capital want to turn it into the biggest global brand for diagnostic imaging and cancer care. The cornerstone of doing this is to introduce practices that are standardised, unified and optimised, but that respect local cultures and remains patient centric. This becomes increasingly complex given the sheer number of geographies that Affidea operates in, as well as the vast amount of data that is accrued on a daily basis. Some of these data come from the Affidea Dose Excellence Programme through which we currently centralise and analyse the information extracted from 65,000 computed tomography (CT) scans each month.

Setting Up The Dose Excellence Programme

Our dose excellence programme has been running for several years under the leadership of Katia Katsari and her team; it incrementally evolves - adapting and learning from each country as it is introduced.

The foundation of the programme was our initial cooperation with GE Healthcare in 2012 on the DoseWatch™ analytics platform. This allowed us to extract the radiation exposure data (as well as other data) from the CT scans performed at our centre in the University Hospital of Szeged, Hungary.

The GE DoseWatch™ system is an excellent tool, but like all tools, it must be used within a system by knowledgeable individuals for the full benefits to be realised – implementation, learning and subsequent action are critical. Having the dose data is great, but fundamentally insufficient without benchmarking it to the regional guidelines and being able to influence the subsequent imaging based not only on dose, but also image quality. The dose excellence programme set out to turn dose awareness and optimisation into a habit, rather than something that ‘just had to be done’.

After the first installation of DoseWatch™ in 2012, a further 15 licenses were purchased in 2013. Then in March 2014, a memorandum of understanding was signed between Affidea and GE for 30 more licenses. In May of 2014, the Affidea dose excellence programme was officially launched.

At first there was a lot of cultural resistance to change. However, this is not unusual in the medical profession, where having an evidence base is absolutely critical to underpin any new initiatives. It came down to communication. A

multi-disciplinary steering committee was set up that was able to clearly outline the strategy, process and goals.

Within each country, and within each centre of that country, we have a named radiologist, radiographer and radiation physicist responsible for the dose excellence programme. They work together closely to push it forward in close collaboration with the regional GE DoseWatch™ teams.

Comparing Analytics Across Vendors

GE Healthcare were early implementers of tracking and analysing software in CT; they also had the foresight of making the platform vendor neutral, meaning that we are now able to compare dose data not only between different models of CT but also different manufacturers using different dose reduction algorithms. However, before this takes place we have to be certain that we are comparing ‘like with like’. An initial part of our dose excellence programme was establishing standardised CT protocols – categorised by anatomic area and clinical indication across all vendors. We currently have 65 standardised protocols that include information not only on how the scan is acquired, but also the third percentile dose reference levels (DRL) that benchmark the radiation dose to the standards. This is another important point - there are no pan-European standards currently available

so we have had to develop our own specific ‘Affidea standard’ that can encompass all the variables.

As well as standardised inputs and measuring, the processes also have to be uniform across each country. Thus, we created Affidea standard operating procedures and guidelines for the comprehensive implementation of the programme.

These include quality control, mapping and how to implement changes. Calibration of CT systems is standardised across the whole network.

All doctors work to the best of their ability and are very keen to show you what they do. Radiologists (I am one) like to show nice images: ‘Look at the great pictures we are getting and the great diagnostic capability they give us’. The problem is that without insight into the data, and some idea of the regional benchmark, you can always get nicer pictures by giving a higher dose. Meanwhile, many CT radiographers want to reduce the dose, but often this is done in an unstructured manner - the exposure is reduced, the images become grainier, the radiologist complains and then the exposure increases again. It is a kind of yo-yo. This is why image quality has to be a key output of the dose excellence programme. Without incorporating this aspect of the process, clinicians will not sign up to the process.

“WE HAVE THE SCALE OF A COUNTRY WITH THE SPEED OF AN INDEPENDENT COMPANY”

The dose-optimised images have to be non-inferior to the routinely acquired images and we have processes in place to measure image quality both subjectively (blinded image assessment) and objectively (using phantoms).

At Affidea, we have the scale of a country with the speed of an independent company. We don't have the lethargy of a national body or government or university, where any change implementation takes months, if not years. We also have the expertise of being a specialist high-end diagnostic imaging provider and this is what we do.

On a monthly basis, we upload all the data from all the servers onto our central system. We extract all the data and we export the metadata.

This is important - we don't export individual patient data, just the homogenised group data to avoid patient confidentiality and regularity issues. We have currently networked just over half our install base, and are already acquiring the data from 65,000 CT scans per month.

Patient Safety Is Fundamental

The fundamental thing is individual patient safety; this is the key driver across the whole network. However, given the scale of our operation we can go from the individual to looking at the imaging trends across and between whole countries. This also allows dissemination of best practice and collegiality. For instance, the dose excellence group in Hungary are collaborating with the dose excellence group in Greece to perform blinded assessments of each others' optimised images.

Then there is a comparison between technology and vendor

so we can compare Siemens to Philips to GE. We can look at energy use, effect of dose reduction algorithms and even the effect that dose optimisation has on the working lifespan of the x-ray tube.

Despite the focus on standardisation and unification of pathways and processes, we do not forget that medicine remains an art, and that to have a truly patient-centred approach there must be nuances in delivery of care. One size does not fit all, but understanding and justifying variance allows outliers (by whatever measurement) to be scrutinised. It has been the experience of the dose excellence programme that clinicians respond where negative variance can be demonstrated, and solutions offered to improve practice. Having a high radiation dose scan does not cause censure where it can be justified on reasonable clinical grounds. Thus, the system becomes one that everyone feels happy to engage with.

Conclusion

As far as we know, the Affidea dose excellence is the largest dose optimisation programme of its kind. We have shown that with the correct processes, standards and engagement with staff it is possible to take an analytic tool and make it a powerful agent for change.

It is true that 'you can't manage what you can't measure', but once the correct analytic tool has been developed, measurement becomes relatively straightforward. More complex is the choice of data to focus on, and the management processes used to influence and implement change. ■



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RADIOLOGY IN THE CARE CONTINUUM



Geraldine McGinty

Assistant Professor of Radiology
Assistant Chief
Contracting Officer
Weill Cornell Medical College
New York, USA

Chair
Commission on Economics
American College of Radiology

gmcginty@acr.org

drgeraldinemcginty.com

@DrGMcGinty

Where do you see radiology's place in the care continuum?

I see radiologists as fundamental and integral to the care continuum. Traditionally, rounds ended in the radiology department. There was a sense that you had not completed the task of evaluating the patient without bringing the radiologist into the conversation. We need to return to that. Recently I was on a call with the Centers for Medicare & Medicaid Services (CMS), and one staffer remarked that he was excited to see radiology at the nexus of clinical care and how radiologists are becoming more visible again and embedding themselves in the care delivery process. Without wishing to be too partisan about being a radiologist, I think that we are really central to the care continuum, because so often decisions require imaging and the expertise of the radiologist for the patient to move on to the next step.

Are there specific ways that radiologists can add value and position themselves at the heart of the care continuum?

It starts with being visible and being there. With the advent of Picture Archiving and Communications Systems (PACS), radiologists could interpret images remotely from where they were obtained. We became less obvious and less available to our clinical colleagues. Radiologists are taking a number of measures to become more visible, including setting up shop in the clinic, setting up consultation clinics and being much more proactive about being at case conferences and tumour boards. In my own institution our residents present at ICU rounds. They bring an iPad with all the images, and can review them with the team at the bedside.

Will greater visibility help to attract more medical students into radiology?

If you love what you do and see the hugely exciting possibilities in being a radiologist it is disappointing to think that we are not communicating that effectively to medical students. We realise that we have to attract medical students earlier in their career, because often they do not complete their radiology rotation until later in their medical school experience, by which time they have already settled on a training path. In my institution we have been having some events with medical students in their first few weeks of training. Every career has some days that are not so exciting and are routine. However, most of us in radiology are hooked! Our days are enhanced by moments when we really feel like we are making a difference, when we have really struggled through a difficult case and have come to the answer or we have done a procedure that has really changed the outcome for a patient. We have to effectively communicate those moments to medical students so they understand the possibilities.

At Massachusetts General Hospital in Boston, for example, they have a day where they set up a tent on the hospital grounds

and have medical students spend a day with their faculty, who show the students the vascular procedures and biopsies we perform. The American College of Radiology (ACR) is working on a pilot programme on improving diversity in radiology, as we are not doing as well as some other specialties. By bringing in medical students early, having them meet practitioners and understand the possibilities earlier we are trying to make sure that the best and brightest medical students and those who really can contribute are choosing radiology.

In your own institution how do you demonstrate radiology's place in population health management and in the care continuum?

In terms of population health management we have a very active mammography programme, and in the past year we launched a lung cancer screening programme. In terms of being visible in the care continuum, it is a philosophy of our department and our entire institution that collaboration allows us to deliver better care – it's in our DNA. Our radiologists share the ethos of being very tightly embedded with their other colleagues.

Could radiologists be more involved in developing and using care pathways?

Radiologists have been involved in this, but it is becoming more formalised in the U.S. as we plan for the implementation of the legislation around clinical decision support. Care pathways are a facet of that. In some instances there is a decision pathway for the referring physician, who has a patient with a particular clinical picture and who needs to know what is the appropriate imaging. Other clinical areas have a more longitudinal decision pathway. We are looking at areas such as stroke, and we are working with oncologists on follow-up imaging for cancer patients. We use evidence where possible, and, where the evidence is not there, we work on developing that evidence. We are bringing together the different stakeholders around the clinical issue to try and develop the care pathway that is going to give us the best outcomes for the patient.

Are 'turf wars' an issue for radiology in the United States?

I hope that the recent emphasis on value-based care will focus us on the best outcome for the patient and the best value for the healthcare delivery system. Whoever can do the procedure most effectively and contribute to the most effective outcome will perform it. In my personal experience as a breast radiologist, the best physicians want to focus on the thing that they uniquely can do to the benefit of the patient. This focus on value will hopefully drive us to put the patient in the centre and really make the patient our focus — not our own turf.

What advice would you give radiologists on finding time to become more visible?

For our department the patient experience is paramount. It starts when you come to the front desk. There is a picture of the radiologists on duty that day and an invitation to speak to them. We should welcome it when our patients have questions, because we know that more engaged patients are more likely to be compliant with recommendations. We are part of that engagement, helping patients to understand what we see. When I'm recommending a biopsy and trying to reassure my patient that it's probably going to be benign, showing her the tiny little calcium deposit on the mammo-gram so that she knows that even in the worst case scenario we are dealing with something small brings such a look of relief on her face. We have such a critical role to play in contributing to that sense of patient engagement and patient satisfaction. In terms of how radiologists can find the time for these activities I understand the concern, and I talk to radiologist groups around the country about how you find this time. What I hear back, and this has been my personal experience, is that that sense of satisfaction that you can get from delivering care directly to that patient is really motivating. Actually interacting with that patient is fuel, it keeps you going, gives you a sense of why you are doing what you do.

“COLLABORATION ALLOWS US TO DELIVER BETTER CARE”

The American College of Radiology has launched the Radiology Support, Communication and Alignment (R-SCAN) network, which has as one of its aims to forge a collaborative cross-departmental approach. What is the idea behind this?

R-SCAN is a way to help physicians understand how to order imaging more appropriately, using clinical decision support (CDS). As physicians we are required to conduct quality improvement projects for our maintenance of certification.

In addition, we want to help physicians understand what CDS means. This programme achieves both of those goals. In a nutshell you work with a number of your referring physicians to understand where they are now with the appropri-

ateness of ordering, and see how they can improve after learning more about appropriate imaging and the clinical decision support process. The ACR was awarded a grant from a CMS programme (innovation.cms.gov/initiatives/Transforming-Clinical-Practices), *Transforming Clinical Practices Initiative*, with the aim of getting physicians to practise differently. This is a way to help physicians understand how to order imaging more appropriately. The goal is to recruit 1000 radiologists every year, each of whom will recruit five of their referring physicians. ■



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CARDIOLOGY IN THE CARE CONTINUUM



Claire Pillar

Managing Editor
HealthManagement.org
The Journal

cp@healthmanagement.org

The case for coordination of cardiology services across the care continuum would seem to be compelling, given the complex needs of cardiac patients. Siloing cardiac care can lead to fragmented treatment, increased costs and lowering of quality. However, in practice this collaboration and coordination can be difficult to implement.

Barriers to care coordination are explored in a report from the Advisory Board Company, *Mastering the Cardiovascular Care Continuum: Strategies for Bridging Divides Among Providers and Across Time* (Advisory Board Company 2012), who write: "Disease complexity, diverse specialist involvement, and multiple treatment options leave no choice but for programmes to work cohesively." Their 14 strategies for bridging divides among providers and across time are grouped into 5 areas:

1. Building the collaborative care infrastructure

This includes setting up the infrastructure that promotes collaboration, such as multidisciplinary boards and committees, encouraging communication, implementing team-based care and including all stakeholders, such as health IT specialists and radiologists.

2. Deploying cooperative patient care

Team members need to work in concert to deliver ultimate benefit to the patient. The report offers guidance on the optimal use of the various health providers.

3. Executing successful patient transitions

Improving patient transitions has been proven to reduce readmissions. Such programmes have core elements that include patient education, medication reconciliation and follow-up care.

4. Enhancing longitudinal patient care

Patient care after discharge can include use of risk stratification, transitional coaches, and better relationships with postacute providers.

5. Encouraging patient loyalty – improve patient compliance, and develop and enhance disease management offerings.

The report emphasises key elements for success:

- Risk stratification;
- Patient engagement remains relevant across the care continuum. Patient comprehension of instructions, adhering to a care plan and making necessary visits to physicians are absolutely critical to ensuring consistency.

Healthcare IT: patient information needs to be available when and where it is required.

Such a transformation would see seamless care for the cardiovascular patient:

"The mastered continuum will begin upon admission, where a patient will be treated by an order set developed by an entire committee of providers and rounded on by a multidisciplinary team. A transitional coach will ensure all aspects of discharge, including education, medication reconciliation, and exchange of patient information to the next site of care is completed. Upon discharge, the patient is able to return home and, fully aware and engaged, continues to adhere to the prescribed care regimen, with periodic visits to a personal physician and perhaps a disease management clinic" (Advisory Board Company 2012).

The American College of Cardiology's health policy statement on cardiovascular team-based care is a welcome addition to the literature. It offers extensive guidance on implementing a care-based model to improve care coordination, and particularly addresses the contribution of advanced practice practitioners,

such as nurse practitioners, physician assistants and pharmacists. (Brush et al. 2015).

The document's creators explain: "This document will increase awareness of the important components of cardiovascular team-based care and create an opportunity for more discussion about the most creative and effective means of implementing it." The policy statement also explores training and qualifications of team members, leadership and accountability, barriers to CV team-based care, examples of effective team-based care and opportunities for improvement.

Kaiser Permanente Collaborative Cardiac Care Service

A well-established initiative that uses team-based care across the continuum is the Collaborative Cardiac Care Service at Kaiser Permanente in Colorado, USA. The services comprise a nursing team and a pharmacy team that work collaboratively with patients, primary care doctors, cardiologists and others to coordinate proven cardiac risk reduction strategies for patients with coronary artery disease. The service is supported by an electronic medical record and patient-tracking software. The software records all patient interactions, keeps track of appointments and stores data that can be used for evaluation and analysis. In a study published in 2008 (Sandhoff et al. 2008), the results showed a reduction in

“ SILOING CARDIAC CARE CAN LEAD TO FRAGMENTED TREATMENT ”

all-cause mortality associated with CAD by 76% in patients followed by the service.

Cardiovascular Care Transformation in Utah

A service redesign at the University of Utah health system has transformed cardiovascular care. By organising services to follow the care continuum, both patient satisfaction and market share have increased.

The transformation is highlighted in a case study that describes the changes that took place to redevelop a service with low market share, low patient satisfaction and specialists existing in silos in their departments (Algorithms for Innovation 2014).

“The entire structure was redesigned to provide seamless, efficient and coordinated care for patients,” says Outpatient Cardiovascular Service Line Director Steven Tew, MHA, MBA. Medical assistants, previously hired by individual physicians, now took an integral role in patient navigation. The medical assistants staff a centralised phone line that offers patients a single information gateway. As many cardiovascular patients have complex treatment plans and need to see different specialists, the medical assistants can offer efficient assistance, for example changing appointments, scheduling multiple appointments with different physicians on one day through to greeting patients when they arrive. ■



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CARE COORDINATION

EXECUTIVE SUMMARY



ECRI

ECRI Institute
Welwyn Garden City, UK
info@ecri.org.uk
ecri.org.uk
@ECRI_Institute

For its fourth Deep Dive™ analysis of a particular patient safety topic, ECRI Institute Patient Safety Organization (PSO) selected care coordination issues affecting patients throughout the continuum of care. Poorly coordinated care puts patients at risk for preventable events, such as medication errors, lack of necessary follow-up care and diagnostic delays and errors. These errors and delays, as well as care gaps, can lead to repeat testing and procedures, a dissatisfying care experience and preventable patient harm, including unnecessary hospital readmissions.

Historically, the patient's primary care provider followed the patient's care from the hospital to the home or to other healthcare settings. In many instances, this no longer occurs. Hospitalists, for example, now typically oversee patient care in the hospital setting. Outside the hospital, patients may have multiple specialty providers in addition to their primary care provider. Besides a family doctor, a patient may seek care from a cardiologist, dermatologist, endocrinologist, gastroenterologist, gynaecologist, neurologist, orthopaedist, physical therapist, rheumatologist and others. In addition, when any of the specialists prescribes medications, the patient may obtain them from multiple pharmacies, including mail-order sites.

Coordinating the patient's care among all of these various providers and across multiple care settings—from a hospital to a rehabilitation facility to the patient's home, or from a hospital to a skilled nursing facility—is a huge challenge. On top of this challenge are various contributing factors that can impede care coordination, including patient information that is unavailable, inaccurate, not timely, or incomplete, as well as patients' limitations in understanding their needs (eg, understanding what medications they are taking and why, knowing whom to see for a particular care issue) so that they or a designee can safely and reliably care for themselves.

With increased attention in the public and private sectors to care coordination and its effect on patient safety, more healthcare organisations are addressing this important patient safety topic. Contributing to the discussion is the emergence of the electronic health record, which many argue will eventually help to promote the clear exchange of patient information across healthcare settings and among various healthcare providers.

Limitations

As with each Deep Dive undertaken by ECRI Institute PSO, the analysis is based on event data that is voluntarily reported by healthcare organisations; most likely, there were many more care coordination events occurring during the time period of the analysis that were not reported through the ECRI Institute PSO database. The analysed data provides a snapshot of those care coordination events that organisations chose to report and offers insights into the issues that organisations confront in coordinating a patient's care from admission through discharge; however, because the data does not represent the universe of care coordination events occurring during the period of the analysis, no conclusions can be drawn about the frequency or severity of care coordination events and trends over time. Also, because the events for this analysis are reported by hospitals, the representation of care coordination events in our analysis leans toward those that occur in the hospital rather than those that occur in the ambulatory setting once the patient is discharged.

What ECRI Institute PSO Found

For its Deep Dive on care coordination, ECRI Institute PSO analysed 223 events reported by 38 facilities. The events were submitted to ECRI

Institute PSO and its partner patient safety organisations (PSOs) over three and a half years, starting in September 2011 and ending in mid-January 2015. The analysis includes both near-miss events (events that are detected before reaching the patient) and events that reached the patient, a few of which caused temporary or permanent harm. The reports reflect events occurring in the hospital and at or after discharge.

Among the results from the analysis, ECRI Institute PSO found the following:

- The majority of the events (138, or 62%) involved care coordination issues arising during the hospital stay; the remainder (85, or 38%) occurred during or after the discharge process.
- The largest share of all the care coordination reports, whether an inpatient- or discharge-related event, involved medications (see Figure 1), representing 51% (113) of all analysed events; 71% (80) of all medication events were attributed to medication reconciliation failures (see Figure 2).
- Laboratory testing and diagnostic imaging incidents contributed to 20% (27) of the inpatient care coordination events.

“IMPORTANCE OF ENSURING THAT PROVIDERS ALONG THE CARE CONTINUUM WORK TOGETHER AS A TEAM”

- The top four contributing factors for both inpatient and discharge care coordination events were human factors (associated with 131 events), communication breakdowns (98 events), policies and procedures that were either unclear or not in place (65 events), and limitations in staff qualifications (53 events) (see Figure 3).
- Almost two of every five care coordination events in the inpatient setting (38%, or 52) involved inadequate handoffs.
- The majority of the events for which a harm score was provided were caught before causing any harm to the patient (79 of 91 events, or 87%).

The events described an array of issues that can interfere with care coordination during inpatient and discharge processes, including the following:

- Failure to follow up on orders for medications and testing, leading to delays;
- Mistakes in the medication reconciliation process at various stages of patients' care spanning admission to discharge;
- Lack of clarification as to who is responsible for a patient's care, such as when a patient's doctor goes on vacation;
- Failure to report changes in a patient's condition to the providers responsible for the patient's care.

The examples illustrate the importance of ensuring that providers along the care continuum work together as a team and communicate among each other about the patients' care.

Improvements in care coordination depend on providers in all healthcare settings recognising their shared responsibility to facilitate seamless patient transitions along the care continuum. ECRI Institute PSO's Deep Dive report reviews the effect that issues such as medication reconciliation, discharge planning, care transitions, patient engagement, and more can have on care coordination along the healthcare continuum. The report provides recommendations to address these issues and, in turn, to improve care coordination.

Key Recommendations

Leadership

- Provide support for the organisation's care coordination improvement initiatives to mobilise the many stakeholders who contribute to the efforts and to provide the necessary resources and staff to support the initiatives.
- Solicit feedback from patients and their family members about their care experiences.
- Consider the business case for care coordination initiatives (ie, quantify the cost savings from specific risk mitigation strategies, such as medication reconciliation).
- Assign a multidisciplinary team responsible for identifying improvement projects and led by a project champion to oversee the team's day-to-day work.
- Support care coordination improvement strategies that incorporate a hierarchy of error reduction techniques.

Event Reporting, Identification and Analysis

- Develop a safety culture, supported by nonpunitive event reporting policies, in which frontline staff, clinicians, and others recognise the value of reporting events and near misses associated with care coordination.
- Learn to evaluate events from the perspective of care

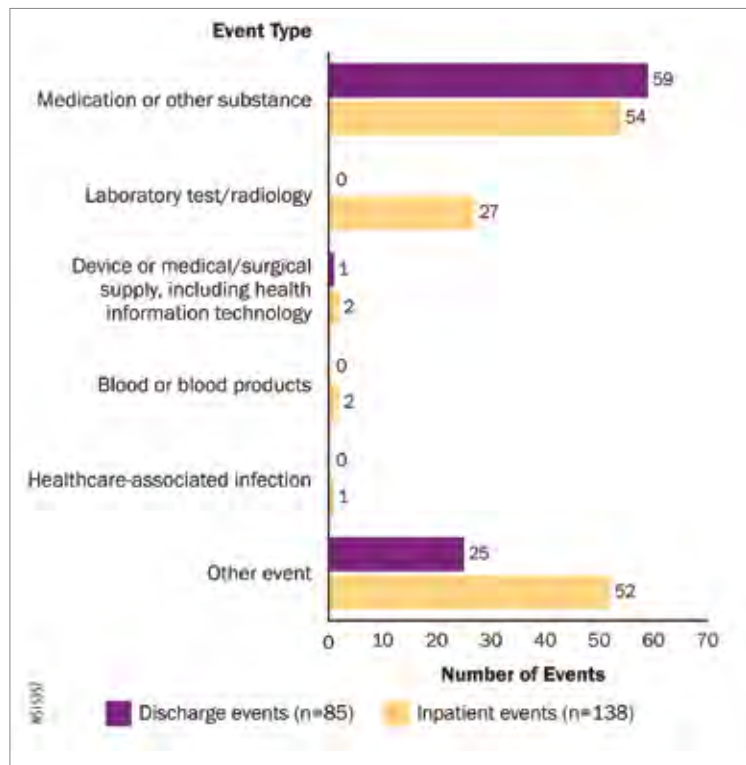


Figure 1. Care Coordination Events by Type (N = 223)

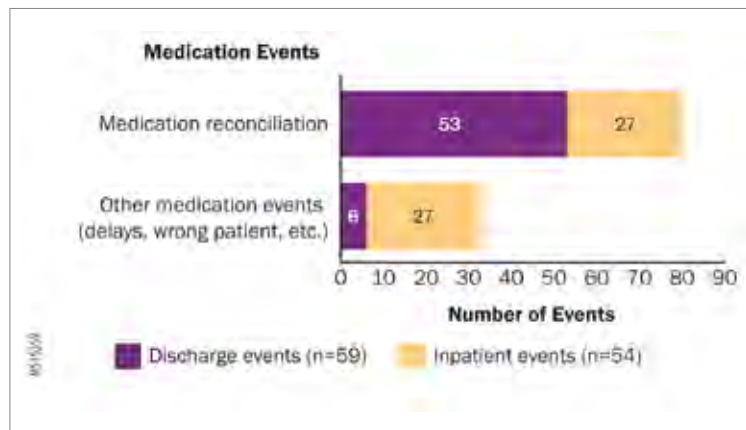


Figure 2. Care Coordination Medication Events

coordination and to consider how different event types, such as medication or testing errors, can involve care coordination.

- Look beyond the data in the organisation's event reporting programmes to other data sources (eg, case management reports, patient surveys and complaints, trigger tools, reports from other organisations) to evaluate care coordination processes.
- Consider ways to encourage reporting and feedback about the discharge process from physician practices and other

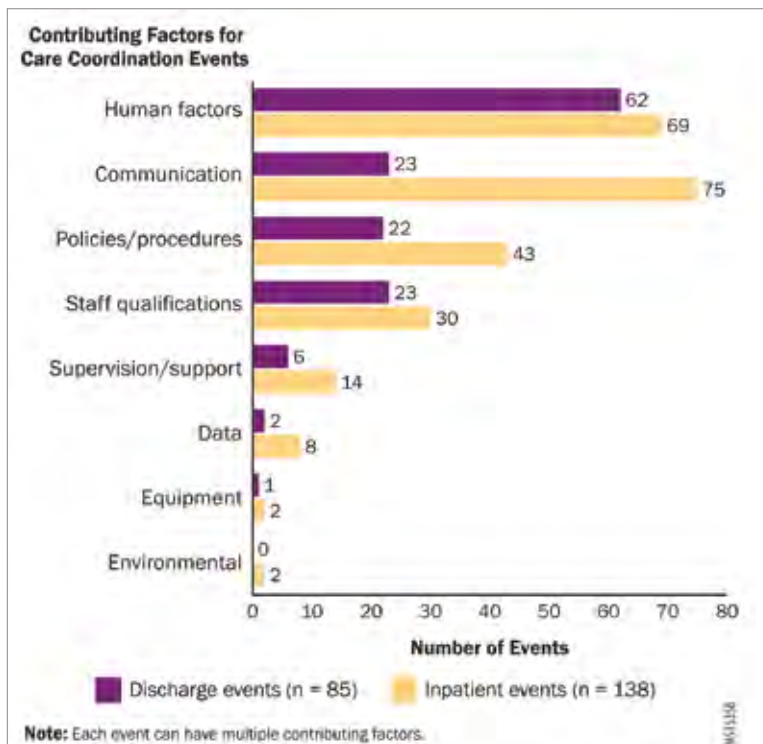


Figure 3. Contributing Factors for Care Coordination Events (N=223)

ambulatory settings and from postacute care facilities.

- Consider using the Agency for Healthcare Research and Quality's readmissions Common Format, once it is finalised, to evaluate readmissions and identify prevention strategies.

Medication Reconciliation

- Adopt a systematic and comprehensive process for medication reconciliation, and conduct medication reconciliation each time a patient transitions to a new level of care along the continuum of care.
- Identify a medication reconciliation process that is suited to the organisation's needs; refer to the numerous resources available to assist organisations with medication reconciliation.

Communication and Information Transfer

- Adopt practices—such as handoffs, briefings and huddles, and multidisciplinary rounding—that simplify and standardise communication and enhance patient safety by reducing communication breakdowns.
- Recognise that effective care transitions between hospitals and postacute care providers are a two-way responsibility.
- Develop a standardised transfer form to communicate the necessary information that a postacute care provider will need when a patient is transferred from the hospital to the postacute setting.
- Foster collaborative strategies (eg, regular meetings at provider sites, discussion about suboptimal transfers) to build relationships of mutual trust between hospitals and postacute care providers.

Discharge Planning

- Develop a comprehensive approach to discharge planning to ensure all patients are appropriately discharged with the provision of adequate postdischarge services.
- Identify personnel (eg, nurses, case managers, social workers, nurse navigators) who will assist patients and their caregivers in navigating the discharge process.
- Engage patients and their family members in discharge planning and education.
- Conduct follow-up visits (eg, by telephone) with the patient after discharge to address any questions and promote compliance with the discharge plan.

Health Information Technology

- Recognise health information technology's (IT) promise in improving care coordination and promote the efficient exchange of electronic patient information, but pay careful attention to system planning, implementation and ongoing use to ensure the technology's safe and appropriate use.
- Perform data analytics on patient data collected by health IT systems to promote better care coordination and identification of lapses in patient care.
- Promote patients' electronic access to their healthcare data through patient portals to enhance partnerships between providers and patients, leading to improved care coordination

Patient and Caregiver Education and Engagement

- Involve patients and their caregivers with shared decision-making by patients and providers.
- Include the patient in developing their plan of care.
- Ensure that patients understand the information given to them regarding their care.
- Target patient education to meet the individual's needs.

Performance Improvement

- Conduct a proactive risk analysis to identify performance gaps in the organisation's approach to care coordination processes, such as the medication reconciliation process.
- Identify metrics to measure the effectiveness of care coordination activities and to identify additional areas of performance improvement.
- Select hospital performance goals for care coordination that are specific and measurable.
- Ensure regular review of the data by the organisation's quality or performance improvement committee.
- Provide reports to senior leaders on the effectiveness of care coordination initiatives to sustain the organisation's commitment in this area.

Share, Learn, Protect

The Patient Safety and Quality Improvement Act of 2005 created a framework for healthcare providers to improve patient safety by sharing data with PSOs that provide analysis and feedback regarding patient safety matters in a protected legal environment. Additionally, PSOs can collect the information in a standardised format in order to aggregate the data and learn from it.

By looking at the information from the shared events, ECRI Institute PSO's Deep Dive analysis of care coordination identifies



ECRI Institute, a nonprofit organisation, dedicates itself to bringing the discipline of applied scientific research in healthcare to uncover the best approaches to improving patient care. As pioneers in this science for nearly 45 years, ECRI Institute marries experience and independence with the objectivity of evidence-based research.

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

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

the many ways that inadequate care transitions can jeopardise patient safety by causing medication errors, wrong treatments, diagnostic delays, poorly managed transitions to postacute care settings and more.

Many of the events reported to ECRI Institute PSO and its collaborating organisations describe the challenges to care coordination within the hospital, at discharge and during transitions from the hospital to other settings. Fortunately, numerous public- and private-sector initiatives are emerging to address these challenges. Many of these strategies—such as reengineered discharge planning, comprehensive medication reconciliation, collaborative models of care transitions, patient engagement at discharge and carefully designed health IT systems to support health information exchange—are discussed in ECRI Institute PSO's report.

As healthcare is increasingly delivered outside the hospital, hospitals must work with providers along the continuum of care to identify the care coordination challenges that arise beyond the hospital in ambulatory settings and in postacute care. Identifying these issues and finding solutions to this vexing patient safety issue requires that providers across the continuum of care abandon siloed approaches to patient care and support smooth and effective care delivery and transitions.

Those organisations leading the charge are already removing many of the barriers to care coordination identified in this Deep Dive analysis. ECRI Institute PSO encourages all healthcare organisations to consider the recommendations of this report and to support the sharing of patient information across the care continuum in order to deliver safe, high-quality patient care.* ■

* For more information about ECRI Institute PSO's Deep Dive reports and toolkits, contact ECRI Institute at info@ecri.org. The reports are also available for sale from ECRI Institute's online store at eshop.ecri.org.

Acknowledgments

ECRI Institute PSO thanks its collaborating member organisations and partner PSOs for sharing their care coordination-related events for this Deep Dive report. Over the course of four Deep Dive projects on various topics, participating healthcare organisations continue to learn multiple patient safety lessons from the aggregated analysis of shared events. ECRI Institute PSO encourages its members to review the findings from this report and to enlist a multidisciplinary team of representatives from senior leadership, clinical departments and care settings, medical staff, pharmacy, case management, social work, discharge planning, information technology, risk management, patient safety, quality improvement and other areas to discuss the applicability of the findings to the organisation. Further, as this analysis demonstrates, organisations must reach beyond their four walls of the hospital setting to other providers in their communities and collaborate to develop better systems for care coordination. Change will happen when the healthcare community is united in its journey to identify strategies to support improved care coordination activities and transitions. In addition to the many individuals at ECRI Institute who contributed to this report, ECRI Institute PSO acknowledges the following individuals for their insights about this report:

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BIG DATA AND THE FUTURE OF THE CARE CONTINUUM



Peter Fleischut

Chief Innovation Officer
NewYork-Presbyterian
Innovation Center
New York, USA
pmf9003@med.cornell.edu
innovatenyp.org
@#innovatenyp

Every facet of the healthcare sector has a role to play in the future of the care continuum as it evolves and faces new challenges. With an increasing segment of the continuity of care relying on effective and efficient filtering of Big Data and development of related systems, government and individual health facilities in Europe and the U.S. are investing in getting ahead of the game through development of IT systems for best patient and professional practice.

One sign of this commitment to betterment of healthcare is the proliferation of Innovation Centres in the U.S.. Many are attached to hospitals while others operate independently. Where cross-collaboration in healthcare is truly a daily experience, all are striving to better the quality of workflow, clinical practice and the patient experience.

Increasingly, Big Data touches on each of these areas and has a direct effect on the care continuum in profound but surprisingly simple ways.

HealthManagement.org had an insight into the workings of one such Innovation Centre and a sneak preview into what the future of Big Data and the care continuum may hold in the day-to-day running of a hospital when it spoke to Chief Innovation Officer, Dr. Peter Fleischut, at the NewYork-Presbyterian Innovation Center at NewYork-Presbyterian Hospital.

The care continuum is a vast network of ideas and practicalities. Where do you see Big Data, IT and the work you are doing as NewYork-Presbyterian Innovation Center fitting into this field? What role does it have to play in the facilitation of smooth interaction in healthcare?

The NewYork-Presbyterian Innovation Center serves as a focal point for the development and application of internal and external innovation at NewYork-Presbyterian. The major focuses of this innovation thus far have been patient engagement and provider communication. The biggest link between these two areas is information. When our doctors have access to real-time, streamlined data, and can then easily share insights with their peers, they are able to make life-saving decisions quickly and more accurately. From a patient perspective, when patients and their families know more about their diagnosis and treatment plan, they're in a better position to participate in their recovery.

HIMSS describes the key areas of the care continuum as extended care, acute hospital care, ambulatory care, homecare, outreach and wellness and housing.

Has NewYork-Presbyterian Hospital done any work in these fields or is it interested in pursuing these areas? Does any initiative stand out and can you say why it was such a success?

We're really proud of our autotexting service, which automatically sends updates to patients and their families about operating and emergency room visits. Not only has this service been widely used, but from positive feedback about the technology we've found that it really helps to address a fundamental need while in a hospital: simple information. We're helping to inform our visitors. We're also extremely excited about the launch of the NewYork-Presbyterian mobile application,

a complete mobile guide to our doctors and services that the patient can use before, during, and after their visit with us. For example, they can learn more about their specific hospital and doctor as they prepare, use our GPS services to navigate within our buildings, and then pay their bill right from their phone.

“ULTIMATELY, WE'D LIKE TO BE PROVIDING EVEN MORE CONTROL, CHOICES, AND KNOWLEDGE TO OUR PATIENTS”

Tell us a little bit about the process of developing IT solutions at NewYork-Presbyterian Hospital. Does the team keep its eyes on developing ideas and pursue them in-house or do entrepreneurs contact the team directly?

Our work is guided by a series of core innovation principles: rapid, sustainable, scalable, mobile and measurable. We have an innovation framework built in to meet these principles. First, we generate ideas from various internal and external sources. Then, we select innovation projects that enhance the clinical or consumer experience and we begin to develop. We test these projects in specific areas or with certain users. Once in place, metrics are collected and we evaluate the technology to determine deployment strategies. We're lucky that we collaborate with a wide range of accelerators and have launched a series of hackathons and challenges. These collaborations are extremely valuable. We've been working with a company to implement a mobile electronic medical record (EMR). By creating a mobile version, the EMR has become a dynamic source of communication and education. But ideas also come from within, and we are particularly dedicated to nurturing a culture of innovation at NewYork-Presbyterian. Autotexting and NYP Connect were developed in-house to meet a tangible need. Those projects were a result of collaboration across many of our IT departments and clinical service lines. We've also generated a set of core goals and streamlined evaluation and development

processes in order to make sure that we're creating efficiently and purposefully. At the same time, we are constantly monitoring trends, like mobile applications, in order to inspire ourselves and identify future collaborators and technologies. The NewYork-Presbyterian mobile app was a result of that evaluation process.

New York-Presbyterian Innovation Center provides solutions both in-house for its hospital and to outside stakeholders. What would you say the ratio is between the two in terms of your collaborations?

Currently, we're approximately 50/50 for patient-focused technologies and provider-focused technologies.

How do you see IT and the care continuum developing over the next 10 to 20 years at NewYork-Presbyterian?

Ultimately, we'd like to be providing even more control, choices, and knowledge to our patients. These goals are a big part of the reason we're so excited about the recent release of our NewYork-Presbyterian mobile app, which allows our patients to learn more about our hospitals, use our online services, and connect with doctors all right from their phone. And that's only the beginning. We're planning future programmes that will give our patients incredible access to NewYork-Presbyterian resources and providers. Our goal, ultimately, is to implement innovative, technology-driven solutions for both clinicians and patients/families to enable NewYork-Presbyterian to deliver the best possible care.

Is there any advice you can offer from a management perspective for anyone working in healthcare tech innovation?

We really focus on the concept of failing fast at the innovation centre. At any given point, we're creating, testing, and prototyping a lot of technology. Some of it won't work or won't be perfect—and that's ok. But what matters is understanding what went wrong, and the iteration process. ■

Key Points

- ✓ Hospitals in the U.S. are investing in Big Data and IT development through bespoke innovation centres.
- ✓ Major focuses in tech innovation have been patient engagement and provider communication with information linking the two areas.
- ✓ Developing innovation is about pinpointing what will enhance clinical and patient experience.
- ✓ Key to the care continuum is the offering of more control, choices, and knowledge to patients.
- ✓ It's all right to fail—but understand where and improve.
- ✓ Governments are investing in innovation and IT development in order to be ready for Big Data expansion.

Technology and Innovation in Healthcare

As technology advances and its potential for implementation in healthcare rapidly increases, governments and agencies are feeling the pressure to stay ahead of the curve.

In the U.S., the number of healthcare innovation centres like NewYork-Presbyterian Innovation Center is growing with development of Big Data implementation a focal point for many. The American Hospital Association says that there are more than 150 healthcare innovation centres across the country with Big Data and IT research central to their work.

"The AHA has been a longstanding advocate for health IT, specifically the rapid adoption of electronic health records," it says. "Research has shown that certain kinds of health IT can improve care. Shared health information will allow clinicians and patients to have the information they need to promote health and make wise decisions about treatments. Health IT can also be a tool for improving efficiency" (American Hospital Association 2016).

Meanwhile, the Advanced Medical Technology Association (AdvaMed) in the U.S., a trade association with international membership that leads the effort to advance medical technology for the betterment of healthcare, says that home-grown innovation is under pressure at the potential cost of the country's leading role in the sector. In order to combat this, last year it produced an agenda to rebuild the innovation ecosystem. These include improving the U.S. Food and Drug Administration (FDA)'s regulatory processes, investment in R&D infrastructure and improving access to international markets (AdvaMed 2016).

In Europe, one of the key driving bodies behind Big Data innovation is DG CONNECT at the European Commission. Pēteris Zilgalvis Head of Unit, eHealth and Well Being at DG CONNECT says: "In the area of research we are financing research on the virtual physiological human, telemedicine, mHealth, remote monitoring of chronic diseases, digital health literacy, patient empowerment in general, interoperability and standardisation. I think what we are going to see as data analytics progresses is that the way to use all types of data is going to increase and as it is put together, the possibilities will be endless. This is something we are trying to support in our Big Data research" (Zilgalvis 2015).

In the UK, a review is looking at ways to improve England's National Health Service (NHS) IT, including electronic health records, to achieve a paper-free health and care system by 2020. *Making IT work: harnessing the power of health IT to improve care in England*, will look at places where IT has worked well and those areas that need improving. It will also look at different ways to implement IT in healthcare as the NHS works towards being paperless by 2020. With an investment of 4.2 billion pounds, the National Advisory Group on Health Information Technology, which includes experts and patient representatives from England, Scotland, Denmark and the U.S., will present recommendations later in 2016 (Department of Health, National Information Board 2016).



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CARE CONTINUUM



Continuum of care includes both services and integrating mechanisms. The services can be broken down into seven basic categories:

EXTENDED CARE

ACUTE HOSPITAL CARE

AMBULATORY CARE

HOME CARE

OUTREACH

WELLNESS

HOUSING

The four basic integrating mechanisms are:

PLANNING AND MANAGEMENT

CARE COORDINATION

CASE-BASED FINANCING

INTEGRATED INFORMATION SYSTEMS

The continuum of care will vary for each patient depending on their unique needs.

Source: HIMSS <https://iii.hm/2bv>

TIPS FOR COLLABORATION

- ✓ a trusted convener, whether an individual or an organisation.
- ✓ the cultivation of trust, through a focus on common goals.
- ✓ a shared understanding of the challenges faced by each participant.
- ✓ starting small and building on early progress.
- ✓ expanding the type and number of participants as needs arise.
- ✓ using both quantitative and qualitative data to identify opportunities for improvement and monitoring progress.
- ✓ focusing on patients' needs and experiences to help spur action.

Source: Commonwealth Fund <https://iii.hm/2c1>

CARE CONTINUUM INSIGHTS

“ A lot of the technology solutions being worked on are really focused on helping our members optimise patient care and succeed in this value-based world. That means tying imaging results to electronic health records and clinical research databases to help evaluate the efficacy and the importance of imaging in the continuum of care. ”

Mike Tilkin, chief information officer at the American College of Radiology (ACR).

Source: Forbes <https://iii.hm/2bw>

According to HIMSS Analytics' 2014 Telemedicine Study, the need to fill care-continuum gaps is what drives providers to adopt telemedicine solutions.

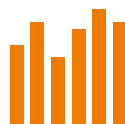
Source: Media Post <https://iii.hm/2bx>

Currently, the total lifetime cost of treating a heart failure patient after diagnosis is over

\$100,000

To begin reducing these costs, programmes must first establish an infrastructure conducive to collaboration through initiatives such as multispecialty strategy boards and committees.

Source: The Advisory Board <https://iii.hm/2by>



An individual person living with HIV may go through several stages and may also return to earlier stages of the continuum throughout his/her life.

Source: U.S. Department of Health and Human Services <https://iii.hm/2bz>

The homes of patients are becoming a more significant part of the care ecosystem, where patients (and caregivers) must manage, monitor and respond to changes in their health. When patient engagement apps integrate patients and caregivers into the care continuum, the financial and emotional burden of delivering care to chronic disease patients is alleviated. Source: Practice Unite <https://iii.hm/2c0>



ASSESSING THE CARE CONTINUUM

Beyond the specific challenges posed by the nature and quality of the existing research evidence as it relates to economic outcomes, there is the broader question as to whether the concept of 'integrated care' lends itself to evaluation in a way that would allow for clear-cut or definitive evidence, given its polymorphous nature. While it may not be possible to generate clear-cut evidence as to the effectiveness of diverse and complex programmes such as integrated care,

there is potential for transferable lessons to be learned across different studies to identify core elements that will support better outcomes.



Source: World Health Organization Regional Office for Europe <https://iii.hm/2c2>



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ESR

Info@eurosafeimaging.org
eurosafeimaging.org



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QUALITY AND SAFETY IN RADIOLOGY A SYMBIOTIC RELATIONSHIP

Guy Frija

Chair
EuroSafe Steering Committee
Past-President, European Society of Radiology
Professor Emeritus, Paris-Descartes University
HealthManagement.org - The Journal
Editorial Board Member,
guy.frija@egp.aphp.fr



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HOW TO COMMUNICATE RADIATION DOSE AND CONTRAST MEDIA INFORMATION

Davide Caramella

Professor
Diagnostic and Interventional Radiology
University of Pisa, Italy
HealthManagement.org - The Journal
Editorial Board Member,
davide.caramella@med.unipi.it



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IMPLEMENTING DOSE MONITORING SOFTWARE IN A RADIOLOGY DEPARTMENT MEETING THE CHALLENGES

Christina Heilmaier

Senior Physician, Quality Manager
Department of Radiology and Nuclear Medicine
Stadtspital Triemli,
Zurich, Switzerland
christina.heilmaier@triemli.zuerich.ch



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Dominik Weishaupt

Chief Physician
Department of Radiology and Nuclear Medicine
Stadtspital Triemli,
Zurich, Switzerland
Professor
Medical Faculty
University of Zurich

EDITORIAL

WHY DOSE? AND WHY NOW?



RADIATION DOSE – THE RESPONSIBILITY OF ALL

The demand for medical imaging examinations is constantly growing, making safety and quality in radiological practice and the risk of unnecessary radiation more important than ever.

Public awareness and concern have grown across a wide range of media. People are worried, they receive conflicting, sometimes confusing information, and they come to the radiology department with these concerns.

Worldwide, stakeholders and educational initiatives have responded to the challenge of radiation dose awareness, and regulations are starting to mandate radiation tracking.

The European Council Basic Safety Standards Directive (Council Directive 2013/59/EURATOM of 5 December 2013) lays down basic safety standards for protection against the dangers arising from exposure to ionising radiation. EU countries must ensure compliance in national legislation by 6 February 2018.

The International Commission for Radiation Protection (ICRP) calls for imaging examinations to be performed adhering to the three fundamental principles of “justification, optimisation, and limitation”.

Nevertheless, reduction of patient dose and risk should never be made at the expense of diagnostic imaging performance. The diagnostic value and the potential risks of an examination should be balanced and it is the responsibility of any radiology department to justify, optimise and limit radiation dose, keeping patients and referring doctors informed.

This special report reviews the initiatives of key European and International organisations, tools and educational supports that are available, the regulations and guidelines in place, how radiology departments can rise to the challenge, as well as a case study of how one department implemented dose monitoring software.



Lluís Donoso Bach

Editor-in-Chief IMAGING
HealthManagement.org - The Journal

President European Society of Radiology

Director, Diagnostic Imaging Department,
Hospital Clínic University of Barcelona, Spain

Executive Director, UDIAT Diagnostic Centre,
Health Corporation Parc, Taulí, Spain

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THE EUROS SAFE IMAGING INITIATIVE

ESR'S 12-POINT ACTION PLAN THAT PUTS QUALITY AND PATIENT SAFETY FIRST



ESR

Info@eurosafeimaging.org
eurosafeimaging.org

Birth of the EuroSafe Imaging initiative

Since its launch in 2014 by the European Society of Radiology (ESR), the EuroSafe Imaging initiative has placed radiation protection at the forefront of efforts to improve quality and safety in medical imaging in Europe in the most efficient and effective way possible.

The demand for medical imaging examinations is constantly growing with increasing pressure to meet the economic concerns of society and the health sector at large, making safety and quality in radiological practice and the risks of exposure to unnecessary radiation more important than ever.

The ESR has taken a major step in raising awareness of the importance of radiation protection at the clinical decision support level with the launch of EuroSafe Imaging at the European Congress of Radiology (ECR) in March 2014.

Charged with setting the campaign's strategy and overseeing its implementation, the steering committee is chaired by ESR Past-President Prof. Guy Frija, and consists of representatives from the ESR, the European Federation of Organisations for Medical Physics (EFOMP), the European Federation of Radiographer Societies (EFRS), the patient organisation European Federation of Neurological Associations (EFNA) on behalf of the ESR Patient Advisory Group, industry group COCIR and an observer from the European Commission. Other professions have also been invited, including cardiologists, orthopaedists and general practitioners.

The aim is to cover the vast majority of clinical scenarios, indications and recommendations in the areas of breast, cardiac, gastrointestinal, musculoskeletal, neurologic, thoracic, urologic, vascular and women's Imaging.

EuroSafe Imaging's mission to support and strengthen medical radiation protection across Europe following a holistic, inclusive approach, has been translated into the following main objectives:

- promoting appropriateness and justification of radiological procedures;
- maintaining radiation doses within diagnostic reference levels (DRLs);
- promoting the application of the 'as-low-as-reasonably-achievable' (ALARA) principle;
- the use of up-to-date imaging equipment;
- developing a strategic research agenda in radiation protection;

- empowering patients through better information and communication; and,

- joining forces by bringing together a variety of stakeholders.

Soon after its launch, EuroSafe Imaging started implementing measures to deliver its mission by developing a comprehensive strategy in the form of the EuroSafe Imaging Call for Action. This was designed to support the International Atomic Energy Agency and World Health Organisation's 2012 Bonn Call for Action, which identifies responsibilities and proposes priorities for stakeholders regarding radiation protection in medicine (International Atomic Energy Authority and World Health Organisation 2013).

Action Plan

EuroSafe Imaging's 12-point action plan aims to make a significant contribution to each of the ten priority areas in the Bonn Call for Action, and it is also geared towards realising the campaign's own objectives regarding appropriateness, DRLs, the ALARA principle, high quality equipment, as well as cooperation with patients and other stakeholders.

ESR iGuide

Adapted from criteria developed by the American College of Radiology (ACR), an ESR expert group initiated the development process of European imaging referral guidelines, known as the ESR iGuide, a prototype of which was introduced during ECR 2015, with pilots continuing in 2016.

Clinical Audit

The ESR's Clinical Audit Tool was launched in 2016. The Standards and Audit Tool provides guidance on how to perform effective audit against the 18 Patient Safety Standards that the ESR considers represent essential good practice in any imaging service.

The standards cover all aspects of patient safety, but particularly focus on radiation protection of the patient and will ensure that radiology departments comply with the audit requirement of the EURATOM Directive. The tool and templates are free to download from the ESR website (myesr.org/cms/website.php?id=/en/services/ESRAuditTool.htm).

Diagnostic Reference Levels (DRLs)

In assuming the lead of a European Commission project on paediatric DRLs entitled 'PiDRL' (eurosafeimaging.org/pidrl),

the ESR also contributed towards implementing measures to maintain radiation doses within DRLs (Action 3).

Education and Training

Education and training to improve radiation protection is of particular importance to the ESR, and the inclusion of 12 modules on radiation protection in its e-learning platform 'Education on Demand' and other orientation sessions were part of the implementation of Action 6 of EuroSafe Imaging's strategy. The ECR in 2015 and again in 2016 included EuroSafe Imaging sessions. More information is available on the EuroSafe Imaging website (eurosafeimaging.org/training).

Collaboration, Communication and Data Collection

With the launch of the cooperation with the research platform MELODI (Multidisciplinary European Low Dose Initiative) and the European Association of Nuclear Medicine, European Society for Radiotherapy and Oncology, EFRS, and EFOMP in 2014, the ESR showed its commitment to Action 7.

Implementation of Action 8 was also started, with the 'Is your Imaging EuroSafe?' survey series incorporated in the ESR's monthly member e-newsletter (esr.frauda.at/gui/newsletter/newsletter.asp?languageId=1&newsletterId=48). The aim of these surveys is to build a European repository based on DRLs for those clinical indications most helpful for self-benchmarking, thereby also contributing to Action 3.

Conceived as an awareness campaign, communicating EuroSafe Imaging's efforts to improve quality and safety in medical imaging (Action 10) is essential. EuroSafe Imaging has published articles in journals and newsletters, issued press releases, and created a promotional video (youtube.com/watch?v=jinJ3nwYDCU).

The ESR also enhanced its cooperation with patients (Action 11), as its Patient Advisory Group for Medical Imaging, founded in 2013, developed a 'driver diagram of patient-centred care'. Other patient-related activities included the publication of an article on EuroSafe Imaging in the European Patients' Forum's newsletter (eu-patient.eu/News/News/EuroSafe-Imaging-Campaign-Towards-Patient-Safety) and the addition of patient-centred information to the EuroSafe Imaging website (eurosafeimaging.org/information-for-patients).

Joining forces with a variety of stakeholders (Action 12) is an essential part of the structure of EuroSafe Imaging. Not only does the campaign directly incorporate external stakeholders in the EuroSafe Imaging Steering Committee, the ESR also uses the initiative as a framework to actively engage with decision makers at the national, European and international level to effectively represent radiologists' interests. This includes relations with EU institutions, IAEA, WHO and Heads of the Radiological Protection Competent Authorities (HERCA), the association of regulatory authorities for radiation protection in Europe.

EuroSafe Imaging also aims to foster global cooperation on radiation protection by working with initiatives outside Europe, including Image Wisely® and Image Gently®, while EuroSafe Imaging has pledged its support to the AFROSAFE project, an African radiation protection initiative launched at the 2015 Pan African Congress on Radiology (PACORI) in Nairobi. ■

The EuroSafe Imaging Call for Action is summarised as follows:

1. Develop a clinical decision support system for imaging referral guidelines in Europe.
2. Develop and promote a clinical audit tool for imaging to increase the quality of patient care and improve justification.
3. Implement measures to maintain radiation doses within DRLs.
4. Promote the use of up-to-date equipment and provide guidance on how to further reduce doses while maintaining image quality.
5. Establish a dialogue with industry regarding improvement of radiological equipment, the use of up-to-date equipment and the harmonisation of exposure indicators.
6. Organise radiation protection training courses and develop e-learning material to promote a safety culture and raise awareness of radiation protection.
7. Collaborate with research platforms and other medical professions to develop a strategic research agenda for medical radiation protection.
8. Develop the data collection project "Is your imaging EuroSafe?" and educational project on guidelines "Are you imaging appropriately?"
9. Develop criteria for imaging procedures that use ionising radiation in specific exams and anatomical regions.
10. Improve communication with healthcare professionals through media, conferences and training material.
11. Improve information for and communication with patients regarding radiological procedures and related risks in order to ensure empowerment of patients.
12. Engage with other stakeholders and collaboration with related initiatives and regulatory authorities in Europe and beyond to contribute to a global safety culture in medical imaging.

The ESR invites individuals and organisations to support EuroSafe Imaging's mission of improving quality and safety in medical imaging by signing up to become Friends of EuroSafe Imaging at eurosafeimaging.org.



QUALITY AND SAFETY IN RADIOLOGY

A SYMBIOTIC RELATIONSHIP



Guy Frija

Chair
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guy.frija@egp.aphp.fr

eurosafeimaging.org

Quality of Healthcare

Quality healthcare by definition means safe healthcare, and safety should be managed as an integral part of quality assurance. Safety, as defined by the National Patient Safety Foundation, is *“the degree to which health care processes avoid, prevent, and ameliorate adverse outcomes or injuries that stem from the processes of health care itself”* (National Patient Safety Foundation 2000). The Institute of Medicine defines it as freedom from accidental injury due to medical care, or medical errors (Institute of Medicine 1999).

Safety and quality have been highlighted by the European Commission’s Directorate-General on Health that was tasked with considering the core dimensions of quality of healthcare, including patient safety (European Commission Expert Panel on Effective Ways of Investing in Health 2014).

The Expert Panel listed the dimensions of safety and related goals:

- Development of **safety systems** (including authorities, bodies, culture of patient safety, standards/guidelines) and **strategies** (policies, programmes);
- Development of **patient safety information** and learning systems;
- **Education** and training of healthcare workers, management and administrative staff;
- Encouragement of **multidisciplinary** patient safety on-the-job education and training;
- **Empowering** and informing citizens and patients, including patient involvement in safety policies.

The Panel noted that the most frequently used dimensions of quality of care include safety. However, these dimensions are not mutually exclusive and cannot be considered comprehensive.

The European Society of Radiology’s *Call for an Action Plan for Medical Imaging to Improve Quality of Care and Patient Safety* was launched in November 2014, and aims to target policy-makers to strengthen efforts of harmonisation in regard to quality and safety, education and training, as well as research and technology, in order to significantly improve European healthcare systems, and ensure better quality and safety for European patients (ESR 2014).

To progress harmonisation of safety in imaging across Europe, the ESR calls on the EU institutions to:

- support the establishment of European quality and safety indicators for imaging;
- support an audit of imaging equipment, doses, image quality and procedures of the medical imaging chain in Europe and to develop plans to modernise equipment;
- support efforts to improve communication with patients;

Clinical Audit

Clinical audit on radiation safety is mandatory under the Basic Safety Standards directive. The European Society of Radiology (ESR)’s Audit and Standards Subcommittee has published Level I (basic) audit templates, which address essential patient safety standards, with a particular emphasis on radiation protection.

Essential Patient Safety Standards

Level I (basic) Audit Templates - ESR Audit and Standards Subcommittee

Authority of requestor policy
Authority of requestor policy implementation
Justification policy
Justification policy implementation
Justification policy for women of child bearing age
Reliable system of recording the pregnancy status in examinations involving ionising radiation
CT radiation dose records
Radiation dose in head CT in children
Dose optimisation in CT policy
Implementation of dose optimisation in CT policy
Policy for patient identification prior to procedure
Implementation of policy for patient identification prior to procedure
Prevention of MRI hazards policy
Implementation of prevention of MRI hazards policy
MRI patient safety check
Process for consent for interventional radiology procedures of non-emergency patients
Reduction of the risk of hypersensitivity reactions to contrast media
Policy on the prevention of contrast induced nephropathy (CIN)
Implementation of policy on the prevention of contrast induced nephropathy (CIN)
Appropriate care of acute contrast media reactions
Resuscitation policy/training
Infection control policy
Implementation of infection control policy by staff
Compliance of facilities with infection control policy
Policy on communication of emergency and unexpected findings
Implementation of policy on communication of emergency and unexpected findings
Audit of use of radiation protection by staff
Audit of doses received
Exposure of workers within MRI
Dose variation in CT chest, abdomen and pelvis in adults
Protocol for inadvertent radiation exposure

Available for download from the ESR website (<https://iii.hm/26e>)

- improve inter-institutional cooperation for more coherent action in the area of health;
- support the EuroSafe Imaging campaign (eurosafeimaging.org) to raise awareness of the importance of radiation protection

The International Atomic Energy Authority (IAEA) also issued a draft safety guide *Radiation Protection Safety in Medical Uses of Ionising Radiation* in November 2014 (IAEA 2014).

Patient Safety

The American College of Radiology and the Radiological Society of North America (RSNA)'s public information website radiologyinfo.org includes a section on patient safety, with information on radiology benefits and risks, radiation dose in x-ray and CT exams, and a printable medical imaging record card that patients can use to record their medical imaging history. In addition, the ACR has published a Position Statement On Quality Control and Improvement, Safety, Infection Control, and Patient Education (American College of Radiology 1998).

UCSF's radiology department is an example of a well-developed radiation safety programme that includes an experienced faculty member who devotes much of their time to patient safety (radiology.ucsf.edu/patient-care/patient-safety). The department's website includes guidelines for use of CT and MRI during pregnancy and lactation, as well as MRI and contrast guidelines. They list ten ways to ensure imaging safety:

1. Choosing the most appropriate imaging study
2. Tailored techniques
3. Careful quality control
4. Latest CT technology
5. Special attention for paediatric patients
6. New low-dose CT protocols
7. Shielding
8. Beam collimation policy
9. Appropriate training
10. Radiation oversight committee

To promote patient understanding of radiation risk, health professionals involved need to establish confidence with the patient, emphasise that potential risks are an estimation and not actual, use the concept of benefit instead of risk and explain the quality of the practice and the equipment.

EuroSafe Imaging with the ESR Patient Advisory Group for Medical Imaging have published patient information on radiation risks on its website (eurosafeimaging.org/information-for-patients).

Radiology Errors and Prevention

Errors do happen in the radiology department, with failure to correctly identify patients leading to recognised wrong events, with potential for treating the wrong patient, doing the wrong procedure on the wrong side or the wrong site. The main errors are:

- Wrong examination
- Wrong patient
- Wrong side
- Wrong site
- Wrong CA (contrast agent)

Classification of major radiological examinations in broad category of radiation dose (Adapted from RPOP website of IAEA).

Procedure	Effective Dose mSv	Equivalent number of PA chest radiograph (each 0.02 mSv)	Increased Risk of Cancer	Equivalent Period of Natural Background
No Dose				
<ul style="list-style-type: none"> • MRI • Ultrasound 	Not defined/ applicable	Not applicable	Not known	Not equivalent
Low Dose				
<ul style="list-style-type: none"> • Chest X ray • Extremities 	0.02 <0.1	1 <5	One in a million	Few days
Intermediate Dose				
<ul style="list-style-type: none"> • Lumbar spine • Abdomen • CT head and neck • Nuclear medicine: Thyroid scan or liver-spleen or biliary or renal scan 	1 – 5	50 – 250	1 in 10,000	Few months to a few years
Higher doses				
<ul style="list-style-type: none"> • Chest or abdomen CT • Nuclear cardiogram • PET/CT or SPECT/CT • Nuclear: Bone or brain scan or tumour scan • Cardiac angiogram • Barium enema 	5 – 20	250 – 1000	1 in 2,000	A couple of years to several years
Natural background	2.4			

Source: eurosafeimaging.org/information-for-patients

- MR safety
- Wrong protocol
- Pregnancy (technician/radiologist not aware that patient is pregnant)

Such errors are caused by incorrect order or requisition entry, failure to confirm patient identity, failure to follow site and procedure verification or procedure qualification processes.

Brook et al. (2010) found that poor communication, whether it was verbal communication or IT-related, caused many errors. Others have highlighted communication as the root of errors, for example:

"Poor communication is at the heart of many medical errors" (Woolf et al. 2004).

"Communication failures that contribute to discontinuity of care stem from a variety of causes, ranging from a lack of interpersonal communication skills to barriers in the work environment to suboptimal use of computer networking tools" (Scott 2007).

Low Awareness of Radiation Risk

Surprisingly, there is still low awareness of radiation risk from imaging procedures among healthcare professionals.

Ramanathan and Ryan (2015) surveyed 92 residents, fellows, technologists and radiologists in a hospital group in Ottawa, and found that knowledge of radiation dose and risk is poor among all radiology workers. Only 23% were aware of dose from both single-view and two-view chest X-ray; 50-70% underestimated dose from common studies; 50-75 % underestimated the risk of fatal cancer.

Source: Ramanathan S, Ryan J (2015) Radiation awareness among radiology residents, technologists, fellows and staff: where do we stand? Insights Imaging, 6(1): 133-9.

A survey of 780 Italian radiographers found that only 12.1 percent of respondents regularly attended radiation protection courses. Despite 90 percent of radiographers stating that they had sufficient awareness of radiation protection issues, most underestimated the radiation dose of almost all radiological procedures. About 5 percent and 4 percent of the participants, respectively, claimed that pelvis magnetic resonance imaging and abdominal ultrasound exposed patients to radiation, while 7 percent of the radiographers stated that mammography does not use ionising radiation.

Source: Paolicchi F, Miniati F, Bastiani L et al. (2015) Assessment of radiation protection awareness and knowledge about radiological examination doses among Italian radiographers. Insights Imaging, Nov 23 [Epub ahead of print].

A survey in Turkey of 300 health professionals (100 interns, 100 radiographers and 100 resident doctors) also found low awareness of radiation dose. 41.4 percent of all participants and 46.3 percent of resident doctors underestimated the radiation doses.

Source: Günalp M, Gülünay B, Polat O et al. (2014) Ionising radiation awareness among resident doctors, interns, and radiographers in a university hospital emergency department. Radiol Med, 119(6): 440-7.

EuroSafe Imaging is providing e-learning materials and radiation protection sessions for health professionals.

Such errors can be prevented with clear procedures on MRI safety, identifying pregnancy and contrast agent procedures for iodinated agents and gadolinium chelates. The ESR’s Clinical Audit Templates include a template for implementation of a policy for patient identification prior to procedure.

Safety Reporting

Radiology departments should establish an events registry. One model is the the U.S. Agency for Healthcare Research and Quality-developed Patient Safety Indicators (PSIs) (n.d.) to provide information on potential in-hospital complications and adverse events following surgeries, procedures, and childbirth or the Australian initiative the Radiology Events Register (Mandel 2015).

Variation

It is well-known that radiation dose given during an exam differs between technicians, radiologists, within departments and across countries (Figure 1). The study by Ip et al. (2015) found wide variations in use across the United States and identified potential targets for future imaging quality improvement initiatives, including head CT and lumbar spine MR imaging. “Is my CT justified?” The onus is on the referring physician, in consultation with the radiologist, to prove it.

Is Your Imaging EuroSafe?

Action 8 of EuroSafe Imaging is to develop a data collection project “Is your imaging EuroSafe?” and an educational project on guidelines “Are you imaging appropriately?”

The aim is to build a European repository based on dose exposures for specific clinical indications that can be used for self-benchmarking, for establishing diagnostic reference levels (DRLs) and to provide insights into the influence of the age of the equipment on dose exposure. Data will be collected for adult patients on standard practice and scanner specifications.

Surveys are ongoing on the following procedures:

- CT head: acute stroke
- CT chest: pulmonary embolus (Figure 2)
- CT head: acute head trauma
- CT chest: rule out pulmonary metastases of extrathoracic cancer
- CT chest: HRCT for diffuse parenchymal disease
- CT abdomen: liver metastases
- CT abdomen: urinary calculus
- CT abdomen: appendicitis
- CT Colonography
- Cardiac CT: calcium coronary scoring

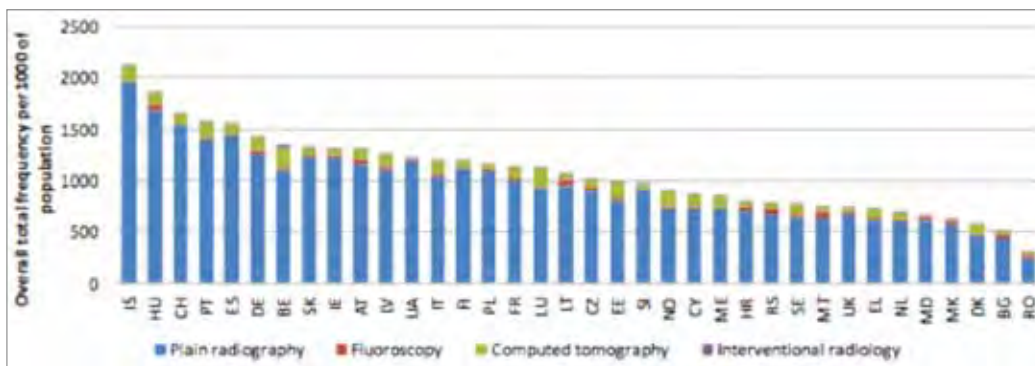


Figure 1. Example of Heterogeneity of Practice
Source: European Commission Directorate General for Energy (2014)

CT chest: pulmonary embolus – Preliminary results

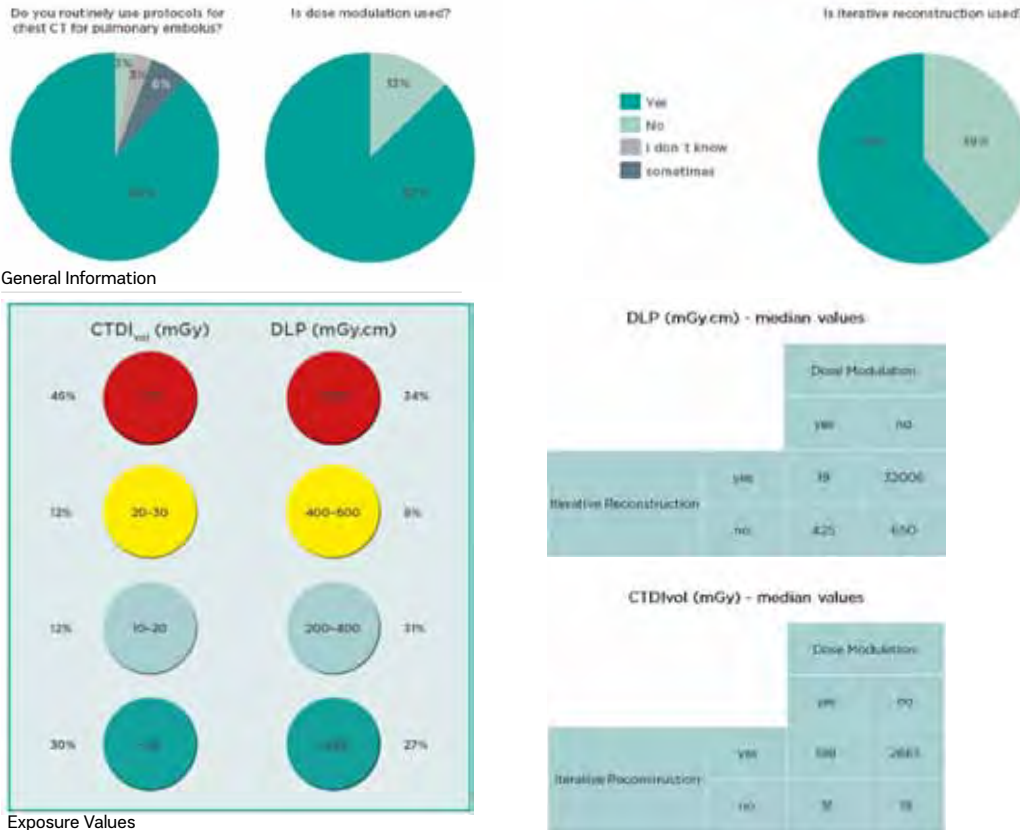


Figure 2. CT chest: pulmonary embolus - Preliminary results
Source: eurosafeimaging.org

Conclusion

Safe use of imaging should remain the main goal. However, quality of practice, organisation and management are absolutely essential for ensuring patient safety, which also implies

a need for access to adequate IT tools. Benchmarking, clinical audit and patient information are also essential in this context and should be developed. Involvement of all stakeholders is crucial. ■



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HOW TO COMMUNICATE RADIATION DOSE AND CONTRAST MEDIA INFORMATION



Davide Caramella

Professor
Diagnostic and
Interventional Radiology
University of Pisa, Italy

Editorial Board Member,
HealthManagement.
org - The Journal

davide.caramella@
med.unipi.it

Public awareness and concern about radiation safety has grown in the last few years, and concerns have been voiced about radiation dose, for example in breast imaging, across a wide range of media. Patients are concerned, as they receive conflicting, sometimes confusing information. Therefore good communication from the radiology department is essential.

How to Communicate

It is a truism, but the choice is never between communicating or not communicating, but between communicating well or badly. When the radiologist does not communicate it encourages the patient to find information on the web, for example on websites that provide a risk calculator where the patient can input data for each study (gender, age, number of exams performed, associated absorbed dose), and the software calculates the effective dose and additional cancer risk. This is very worrisome for patients, because they think,

“RADIOLOGY DEPARTMENTS
NEED A MARKETING STRATEGY”

for example, that they are going for a screening examination to ensure early diagnosis of cancer, but at the same time it increases the chances of getting cancer.

When the communication is there, it can be bad, and it may even have the effect of inducing the patient not to accept the examination that is actually useful for his or her health. Radiologists have to control the “scattering” of information, by avoiding use of confusing acronyms and physical dimensions, such as absorbed, equivalent and effective dose that are familiar to professional staff, but may be confusing for the layperson.

Some departments communicate the risk associated with radiation exposure during the medical procedure by using metaphors. Instead of saying that the patient is getting so many millisieverts (mSv), which are associated with a certain increase in health problems, they propose metaphors that take into consideration risky situations that are more familiar to the patient, such as smoking or driving.

Communication Strategy

Patients do not need to be frightened. I have heard patient groups reacting to the new directive, saying, “We don’t want to know the technical details, we’re not interested in millisieverts”. Most have this reaction, because they trust doctors. They say, “I will go and have the x-ray, because you assure me that I need the examination.” They want to be assured that when they go to a hospital to have an examination, they will receive state-of-the-art service. Radiology departments have to develop an appropriate communication strategy that does not frighten or confuse the patient, and is compliant with the regulation.

Following the new directive, departments will have to record in the radiology report the radiation dose given to the patient. However, radiologists can mitigate this information, which might be threatening or incomprehensible to the patient, by adding information about the department where the examination has been performed and the procedures that are in place to ensure that variations which are not clinically justified are reduced to a minimum, thereby ensuring reproducibility, consistency and quality of all examinations.

Marketing Strategy

Radiology departments need a marketing strategy. Yes, x-rays may be dangerous, but patients have an x-ray exam because it is justified. It is useful to have decision support systems that justify the examination, and patients must be given the information that guarantees that the department is committed to quality service also in terms of radiation dose. Radiology departments should be very clear in their mission statement that in their daily practice they aim for the right diagnoses after the right exam performed at the right time with the right protocol for each patient, with respect to different ages, sex and sizes.

Radiology departments need to measure, and they have to systematically use the quantitative approach in order to improve, where there is a margin to improve. Departments have to show that they are performing meticulous dose tracking for the exams most frequently performed in their department, and show that variation, when it is there, is in examinations that are in principle valuable to the clinical conditions of patients that are inherently different.

Information can be more in-depth: for example, histograms are a way of benchmarking the individual examination with respect to the same type of examinations performed in a

department. Histograms that show radiation dose can reassure the patient that he/she is in the group of examinations that are associated with the least amount of radiation dose. It is a subtle way of benchmarking the individual examination. Histograms can also benchmark data with other radiological groups. Patients having repeat examinations may want to have information about accumulated dose, and departments must be prepared to produce this.

Another marketing opportunity in Europe is to promote the radiology department as a Friend of EuroSafe Imaging (eurosafeimaging.org/friends-of-eurosafe). Friends of EuroSafe are committed to supporting the EuroSafe objectives:

- Promoting appropriateness;
- Maintaining radiation doses within diagnostic reference levels (DRL);
- Promoting the use of up-to-date equipment;
- Use the As Low As Reasonably Achievable (ALARA) principle;
- Improve communication with patients.

Get Ready

Radiology departments have to prepare for the implementation of the European directive by carrying out rigorous preliminary housekeeping. Marketing efforts are counterproductive, if departments do not work in a very controlled way, and examinations are associated with doses that vary quite randomly. If the line of a patient's examination is on the wrong side of



radiological activities aiming at total quality. Departments need to make sure that variations in contrast media usage and radiation doses are all clinically justified, that there is no random deviation, and that all variations can be explained to patients. Dose tracking is needed to ensure systematic, comprehensive and shared collection of data, and the radiology department must act on it in order to improve.

In our department we started this work some time ago, and it is a lot of additional work. We established a dose team, including our chief technologist, three junior technologists, a medical physicist, an engineer and a medical student. They help me to make sure that this software provides data, and that these data do not contain errors, because sometimes the raw extracted data may need to be analysed further.

It is not easy to obtain additional help in a time of cost-containment, but careful planning should be put in place before embarking on a project of radiation dose and contrast medium tracking, because this will certainly be an additional activity for already busy radiological departments. ■

“ THE ADOPTION OF RADIATION DOSE AND CONTRAST MEDIUM TRACKING SOFTWARE SOLUTIONS IS NOT AVOIDABLE ”

the histogram without a valid clinical reason, this is not good for the department's image. Radiology departments will be increasingly transparent, and when numbers will be on the report they have to be absolutely ready.

There are many commercially available radiation dose and contrast medium tracking software solutions. There is healthy competition, and the radiological community can choose the tool that is best suited for their local situation, IT infrastructure and PACS system. In my opinion, the adoption of radiation dose and contrast medium tracking software solutions is not avoidable. It is going to be very useful for fine-tuning

UNDUE RADIATION EXPOSURE TOP TEN CHECKLIST

TOP TEN EVIDENCE-BASED INTERVENTIONS

PROCESS CHANGE	IN PLACE	NOT DONE	WILL ADOPT	NOTES (RESPONSIBLE AND BY WHOM?)
Develop a process to collect, store, and analyse patient dosimetry data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Create and implement a “Don’t” list of exams that have little proven value or do not change the course of treatment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Participate in the National Dose Index Registry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Require informed consents specific to ionising radiation examinations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Eliminate routine ionizing radiation orders (eg, a daily chest x-ray).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Provide patients with tools to track their personal medical imaging history.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Assess staff/practitioner knowledge about the risks/benefits of ionising radiation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Develop a toolkit with educational materials about radiation safety for ordering practitioners.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Analyse data/information from EMR alerts and redesign and improve standardized processes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
One size does not fit all: Develop specific criteria for the use of ionising radiation in special cases, e.g. for infants, small children, and pregnant women.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Source: American Hospital Association, Health Research & Educational Trust (2014) Radiation exposure checklist. Available from hret-hen.org/topics/radiation-exposure/13-14/2014-RadiationChecklist.pdf



DOSE CREEP

THE RIGHT TOOLS TO MONITOR DIAGNOSTIC RADIATION EXPOSURES



Listed at no. 7 among the ECRI Institute’s *Top 10 Health Hazards 2015* (ECRI 2014) is ‘dose creep’, whereby dose exposure levels are increased by clinicians over time in order to achieve better image quality in diagnostic radiography.

“Although it is unlikely to result in immediate harm, it’s an insidious problem that can have long-term consequences and that, over time, can affect many patients. Fortunately, tools are now becoming available to help healthcare facilities combat this hazard,” according to the ECRI Institute.

‘Dose creep’ is often seen as an unintended consequence of the progress from film to digital detectors, with the latter considered as ‘more forgiving’ in diagnostic radiography because they have a much wider dynamic range than film and reduce the likelihood for an imaging exam to be repeated.

However, with digital detectors the quality of the image generally improves as the dose increases with a natural tendency to nudge the dose higher to get better-quality images.

Source: ECRI (2014) Top 10 health technology hazards. Health Devices, November. Available from: ecri.org/Resources/Whitepapers_and_reports/Top_Ten_Technology_Hazards_2015.pdf

ECRI Recommendations

- If your digital diagnostic radiography systems are not already equipped to use the standardised exposure index (EI) — as developed by the International Electrotechnical Commission (IEC 62494-1) and the American Association of Physicists in Medicine (AAPM TG-116) and as implemented by device manufacturers — investigate whether a software upgrade is available to add this capability. For new equipment purchases, incorporate EI capabilities into your request for proposal.
- After it has been incorporated into your imaging systems, use the EI to estimate the patient dose and exposure on the detector.
- Take the steps necessary to display EI values to radiographic technologists as part of their routine workflow. This may require a software upgrade or configuration change.
- Install software tools that automatically import and analyse EI data.
- Define responsibilities for tracking and analysing the EI data for the whole department.
- Work toward defining acceptable EI values and ranges for commonly performed radiography studies.

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IMPLEMENTING DOSE MONITORING SOFTWARE IN A RADIOLOGY DEPARTMENT

MEETING THE CHALLENGES



Implementation Considerations

Before planning implementation of dose monitoring software you should be aware of some challenges that need to be met. This is a tool, which offers many options, but the available features may not match your department's expectations and requirements. Awareness of what exactly the department's needs are is essential at the beginning. Furthermore, one should be conscious of the fact that the software indeed is able to register dose data, but it cannot check for plausibility of data.

Step 1: Determine Technical Strategy

If these challenges are accepted the next step is to determine your technical strategy, which includes choosing the right dose monitoring software for your requirements. Consideration of the different modalities that should be linked

“PARTICULARLY AT THE BEGINNING, RESISTANCE TO CHANGE IS OFTEN ENCOUNTERED”

to the software is important, because not all software allows for connection with all modalities. Moreover, to ensure high quality of data input it should be verified that the software can communicate with the hospital information system (HIS) and radiology information system (RIS) and can also be integrated in the local network.

Step 2: Define Organisational Strategy

Then you need to define your organisational strategy, which comprises not only assigning the modalities, but also specifying the scanners/units that ought to be connected with the software to ensure interoperability. This includes considerations about installation of the dose monitoring tool outside the radiology department, where x-rays are used as well (eg, coronary angiography suite).

To successfully implement the software in clinical routine it is advisable to start with one modality only, which preferably should be computed tomography (CT), because CT scans are more standardised than, for example, fluoroscopy-guided procedures, at which various levels of difficulties need to be considered. Moreover, in most countries national defined dose reference levels (DRLs) for indication-based CT examinations are available, which facilitate setting dose thresholds.

Dose Team

To promote implementation of the software, represent dose culture and have contact persons, formation of a dose team is recommended. Ideally this should be composed of one or two radiographers, one board-certified radiologist and the department's IT specialist. Together with the head of the department the dose team should define a few appropriate, measurable, and achievable goals. As particularly at the beginning the dose team faces many tasks, including becoming familiar with the software, they should have protected time for their work.

One of their first challenges is to set reasonable dose reference levels; in our department we either used Swiss DRLs, so far available for 21 indication-based CT examinations (Swiss Federal Authority of Healthcare, 2010), or we derived thresholds by determining the 75th-percentile of the distribution of a defined dosimetric quantity.

Lessons Learnt

After we had installed the dose monitoring software and had started dose data analysis of our CT scanners, we had to solve unanticipated problems.

1. Data Output Relates to Input Quality

Although we knew that a dose monitoring tool is software, we weren't aware that data output depends extensively on the quality of the input. One of our main challenges was to match our own CT protocols with the available national DRLs. For example, our abdominal CT protocols comprise "abdomen and pelvis: unenhanced", "abdomen and pelvis: contrast media-enhanced", "liver protocol", "pancreas protocol" etc., and national DRLs are separated into "abdomen 1: liver, spleen, pancreas, vessels" or "abdomen 2: standard,



Christina Heilmaier

Senior Physician,
Quality Manager
Department of Radiology
and Nuclear Medicine
Städtspital Triemli
Zurich, Switzerland
christina.heilmaier@
triemli.zuerich.ch



Dominik Weishaupt

Chief Physician
Department of Radiology
and Nuclear Medicine
Städtspital Triemli
Zurich, Switzerland

Professor
Medical Faculty
University of Zurich

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abscess, emergency". Thus our internal processes required intensive adaptation at the beginning, which included cleaning our CT protocol list with removal of no longer employed CT protocols (eg, from former scanners), definition of precise protocol descriptions and uniform usage of protocol names. Thereafter, the different CT protocols were assigned to the national DRLs, if available, or to our own set thresholds.

2. Protocol Changes Not Recognised

When we started with data analysis, we frequently encountered the problem that the software did not recognise changes of protocol made after scanning had already started. For example, a patient with rectal carcinoma was enrolled for a CT of the abdomen and, based on this indication, the CT protocol "abdomen standard (single phase)" was chosen. But due to a so far unknown liver lesion a second phase was ordered by the radiologist on approval of the scan. However, in this case the software compares the scan's dose data with the DRL for "abdomen standard", unless the protocol name is changed manually to "abdomen portal-venous and delayed

“SUPPORT, BACKING, AND SPONSORSHIP BY THE HEAD OF THE DEPARTMENT ARE CRUCIAL”

phase". This modification of protocol name is possible within the software as part of the post-processing, and considerably enhances quality of data analysis by limiting the number of false-positive dose alerts.

3. Change Resistance

Particularly at the beginning, resistance to change is often encountered, based on perceived nuisance and extra work, but also due to neglect when a task was not part of clinical routine before. To overcome this resistance and improve compliance it is important to integrate dose monitoring into the daily workflow and to establish a dose culture. We therefore placed an additional computer next to the CT console, on which the software was permanently running. By immediately displaying the patient dose data, the radiographers' awareness regarding radiation safety increased.

4. Optimisation Processes

After having successfully implemented the software in clinical routine, dose data should be collected for several months before optimisation processes are started. The reason is that optimisation ought to be based on valid data, which are the premise to achieve effective and efficient improvements. It is better to first focus on one modality as well as on the most

frequent protocols, as too many changes made at one point may cause confusion, data disorder, and excessive demands of the staff, ultimately leading to failure of the whole dose monitoring project.

5. RIS Integration

Despite being challenging at the beginning there are several advantages that compensate for the efforts to integrate the dose monitoring tool into the RIS. Among these especially the automatic registration of protocol changes during the scanning is valuable, because it considerably alleviates dose data post-processing and analysis (no manual change of protocol name is required) and improves quality of data output. The RIS integration also allows for an automatic display of dose data on each radiological exam report and would enable the use of only one single master IT system, thus significantly enhancing the convenience when dose monitoring software is applied.

Conclusions

Dose monitoring software is a valuable tool for internal and external quality control of dose data. It can be successfully integrated in clinical routine and increases patient and business safety. However, implementation of a dose monitoring tool is a demanding task that requires the support of the head of the department. It is advisable to build a multidisciplinary dose team, which assists in software integration in daily routine and accomplishes a dose culture. It should always be kept in mind that the tool is a software with the quality of data output largely relying on data input. Because of that, dose culture and processes have to be created and implemented by the users, which needs time and resources. ■

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Bundesamt für Gesundheit [Swiss Federal Authority of Healthcare] (2010) Diagnostische Referenzwerte in der Computertomographie Merkblatt [Diagnostic reference levels in computed tomography]. [Accessed: 4 June 2015] Available from bag.admin.ch/themen/strahlung/10463/10958/

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ALL ABOUT THE DOSE



The Basic Safety Standards Directive (Council Directive 2013/59/EURATOM of 5 December 2013) lays down basic safety standards for protection against the dangers arising from exposure to ionising radiation.

EU countries must ensure compliance in national legislation by 6 February 2018



Source: ec.europa.eu/energy/sites/ener/files/documents/CELEX-32013L0059-EN-TXT.pdf

RAISING AWARENESS

International Patient Safety Day

International Day of Radiology

17 September 8 November

AS LOW AS REASONABLY ACHIEVABLE (ALARA) PRINCIPLES

- 1 Time** minimising the time of exposure directly reduces radiation dose
- 2 Distance** increasing the distance between you and the radiation source will reduce exposure by the square of the distance
- 3 Shielding** using absorber materials is an effective way to reduce radiation exposures

BASIC SAFETY STANDARDS DIRECTIVE KEY POINTS



- ✓ System of radiation protection based on **justification, optimisation** and **dose limitation**
- ✓ **Responsibilities:**
 - Justification (referrer, practitioner)
 - Optimisation (practitioner, medical physicist, radiology technicians)
- ✓ **Patients** must be **informed** about risks and benefits of examinations using ionising radiation
- ✓ Screening of patients who have no symptoms, eg, breast screening, should either be part of a health screening programme or have documented justification, following guidelines from relevant medical organisations. Directive also covers radiological health assessment for other purposes, eg, employment, immigration
- ✓ **Diagnostic reference levels (DRLs)** should be used and regularly reviewed. When DRLs are exceeded, corrective action needs to be taken
- ✓ **Medical physicist role:** dosimetry, optimisation, application and use of diagnostic reference levels (DRLs), equipment selection, acceptance testing, QA, analysis of untoward radiation exposures, staff training
- ✓ New **occupational dose limit** for the lens of the eyes - 20 mSv/year
- ✓ **Education and training** on medical radiological practices and radiation protection
- ✓ **Equipment:** new equipment should show dose amount, and be able to transfer dose information to the medical record. Information relating to patient exposure forms part of the report of the medical radiological procedure
- ✓ **Procedures:** use referral guidelines, follow clinical protocols and perform clinical audits. Analyse and learn from accidental exposures
- ✓ **Population dose evaluation** taking into account age distribution and gender

Source: European Society of Radiology (2015) Summary of the European Directive 2013/59/Euratom: essentials for health professionals in radiology. Insights Imaging, 6: 411-7.

ESR EUROSAFE IMAGING VIDEO



FURTHER INFORMATION

EuroSafe Imaging

eurosafeimaging.org

European ALARA Network

eu-alara.net

Canada Safe Imaging

car.ca/en/education/canadasafeimaging

Image Wisely

imagewisely.org

Image Gently

imagegently.org

Radiation Protection of Patients (International Atomic Energy Authority)

rpop.iaea.org/RPoP/RPoP/Content/index.htm

Dose Index Registry

[acr.org/Quality-Safety/National-](http://acr.org/Quality-Safety/National-Radiology-Data-Registry/)

Dose-Index-Registry/

Dose-Index-Registry

ESR Basic Patient Safety Standards and Audit Tool

[myesr.org/cms/website.php?id=/en/services/](http://myesr.org/cms/website.php?id=/en/services/ESRAuditTool.htm)

ESRAuditTool.htm

ACR/RSNA Patient Information

radiologyinfo.org

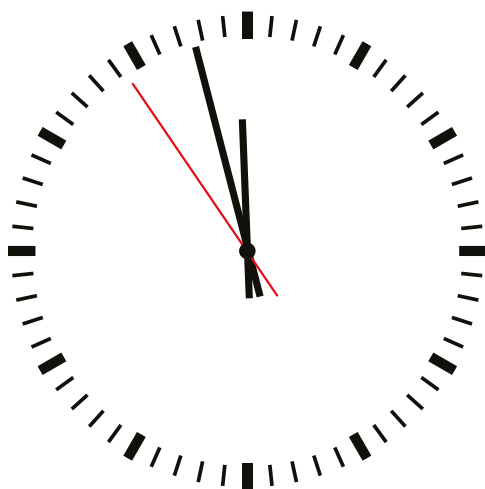
EuroSafe Imaging e-learning Platform

eurosafeimaging.org/training

PATIENT INFORMATION

EuroSafe Imaging eurosafeimaging.org/information-for-patients

UK National Health Service nhs.uk/conditions/Radiation/Pages/Introduction.aspx



About Agfa HealthCare

Agfa HealthCare, a member of the Agfa-Gevaert Group, is a leading global provider of diagnostic imaging and healthcare IT solutions. The company has nearly a century of healthcare experience and has been a pioneer on the healthcare IT market since the early 1990's. Today Agfa HealthCare designs, develops and delivers state-of-the-art systems for capturing, managing and processing diagnostic images and clinical/administrative information for hospitals and healthcare facilities, as well as contrast media solutions to enable effective medical imaging results. The company has sales offices and agents in over 100 markets worldwide. Sales for Agfa HealthCare in 2014 were 1,069 million euro. For more information on Agfa HealthCare, please visit www.agfahealthcare.com



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SIX STEPS TO IMPLEMENT BEDSIDE ULTRASONOGRAPHY

A ROADMAP TO RAPID IMPROVEMENTS IN PATIENT SAFETY



Nidhi Nikhanj

Assistant Medical Director
Banner Telehealth Services
Phoenix, Arizona
USA

Assistant Clinical
Professor of Medicine
David Geffen School
of Medicine
UCLA
Los Angeles, California
USA

This article will provide an overview of how to accelerate adoption of bedside ultrasonography, based on experience in a large hospital system. Developing an evidence-based ultrasound training programme and the economic benefits of proven safety practices, such as ultrasound-guided central venous catheterisation (CVC), will be addressed.

Every day, more than 1,000 patients die in the United States from preventable hospital errors (Hospital Safety Score 2015). Ultrasound at the bedside is an extremely valuable tool for improving the safety and quality of care for critically ill patients, while also helping reduce—or even eliminate—certain errors and associated costs. Applications in critical care range from ultrasound guidance of needle-based procedures to rapid assessment of the heart (“pump”) and volume (“tank”) in patients with congestive heart failure (CHF) or shock.

Steps to Fast-Track System-Wide Adoption of Bedside Ultrasound

Many medical centres, including Banner Health where I practise, now mandate ultrasound guidance for all CVCs. Headquartered in Phoenix, Arizona, Banner Health operates 28 hospitals and acute-care facilities, along with many ambulatory health centres and clinics, across seven states. In 2013, 256,000 patients were admitted to our hospitals, 675,438 patients were treated in our emergency departments, and our clinics managed 2,636,000 visits. With more than 45,000 employees, including about 7,000 medical staff members, Banner ranks among the U.S.’s largest healthcare systems.

Banner Health has launched a system-wide initiative called Care Transformation that unites best practices in clinical care with leading-edge technology to provide better, safer care to our patients. This initiative is designed to reduce the time between identification of evidence-based clinical practices and their widespread adoption and implementation as a predictable part of daily care, including system-wide ultrasound-guided central-line placement and a bedside echocardiography programme with the ability to capture and interpret real-time ultrasound imaging on a 24/7 basis to monitor and guide treatment of ICU patients. Here is how this process worked at our system and lessons learned.

Step 1: Define clinical challenges to be solved by implementing bedside ultrasound

In the early 2000s, one of our chief nursing officers needed to place a PICC line (peripherally inserted central catheter) in a patient with difficult vascular access. She borrowed a

bedside ultrasound machine from the radiology department and successfully inserted the line. This success motivated other clinicians to adopt this approach, initially with informal person-to-person training, followed by small pilot programmes supported by local department budgets.

Establishing vascular access is one of the most commonly performed hospital procedures, with several million central lines placed annually in U.S. hospitals. Up to 78% of critical patients have a CVC inserted at some point during their hospital stay (Gibbs and Murphy 2006), with a documented mechanical complication rate of up to 19% (McGee and Gould 2003), when landmark-based techniques are used.

Step 2. Examine the scientific evidence and safety benefits of bedside ultrasound

Procedural complications are among the most common—and costly—medical errors, according to a recent analysis (Van Den Bos et al. 2011). Of the errors analysed, iatrogenic pneumothorax (the accidental puncture and collapse of the patient’s lung during medical treatment, such as CVC),

“ BROAD ENGAGEMENT OF PHYSICIANS THROUGH EDUCATING THEM ABOUT SAFETY BENEFITS OF ULTRASOUND GUIDANCE ”

was one of the most expensive, costing the U.S. healthcare system \$580 million in 2008. This complication can lengthen hospital stay by 4 to 7 days, at an additional cost of up to \$45,000 (Zhan et al. 2004).

If eliminating such serious safety risks as pneumothorax sounds impossibly ambitious, consider these findings: in a randomised trial that included 401 critical care patients (Fragou et al. 2011), ultrasound-guided CVC reduced rates of pneumothorax and haemothorax to zero, versus rates of 4.9% and 4.4% respectively when landmark methods were used. All other complications were also reduced or eliminated with ultrasound.

Based on robust safety data from multiple studies, evidence-based guidelines from numerous medical societies and government agencies, including the U.S. Agency for Health Research & Quality (AHRQ) (Shojania et al. 2001), the U.S. Centers for Disease Control and Prevention (CDC) (2011),

and the UK National Institute for Health and Care Excellence (NICE) (2002), recommend ultrasound guided placement of central lines as a preferred safety practice.

Step 3. Identify an ultrasound champion and launch a bedside ultrasound training programme

A lesson learned from our experiences is the importance of physician leadership to accelerate adoption of bedside ultrasound. One of our physicians, Dr. Gregory Chu, not only was an early champion of this technology, but also played an important role in developing a training programme to teach respiratory therapists how to insert CVC under ultrasound guidance.

Respiratory therapists were selected as ultrasound trainees for two reasons. First, they are available 24/7 at our hospitals and therefore could perform middle-of-the-night CVCs as needed. Previously, only physicians could place central lines, creating workflow issues and strain on the emergency department when this procedure was needed at unusual hours. Second, our respiratory therapists had already been trained in ultrasound-guided PICC line insertions, so were experienced with this imaging technology.

Our training programme leveraged both internal and external resources. Our simulation centre was employed to provide training with virtual patients, followed by hands-on training with actual patients. We also partnered with our

ultrasound provider, which offered such resources as access to CVC protocols used at other institutions and help with organising training events.

To accelerate diffusion of ultrasound-trained clinicians, Dr. Chu and other physicians trained the initial cohort of respiratory therapists, who then became ultrasound trainers themselves after demonstrating proficiency in central-line placement. All Banner's residents also received the training, facilitating swift adoption of ultrasound guidance across our hospital system.

Step 4. Use clinical teams—and CVC safety bundles that include ultrasound guidance

Banner established dedicated vascular-access teams comprising respiratory therapists and nurses, available around the clock to perform ultrasound-guided line insertions. To reduce central-line associated bloodstream infections (CLABSIs), our health system uses a six-point safety bundle:

1. Hand hygiene;
2. Maximal barrier precautions;
3. Chlorhexidine skin antisepsis;
4. Optimal catheter site selection;
5. Daily review of CVC line necessity, with prompt removal of unneeded lines;
6. Ultrasound-guided line placement.

Latex gloves make great balloons but they make lousy probe covers.

Sure, exam gloves are always close by, but using one as a probe cover is awkward, especially with a large 3D/4D probe. They also allow for wasted ultrasound gel, make an incredible mess, and if the glove is latex, it may cause an allergic reaction in patient, clinician, or both. You, your ultrasound probe, and most importantly your patient deserve better. The Eclipse® 3D, Parker's newest probe cover, was designed solely for 3D/4D probes. Save the gloves for their intended use or for decorating the next office party.

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About 30% of ICU patients suffer one or more health-care-associated infections (HAIs), according to the World Health Organization (WHO) (2016). About 75,000 hospitalised patients die from HAIs annually, with CLASBIs causing death rates ranging from 12 to 25 percent.

Hospitals that use central-line safety bundles that include ultrasound guidance have seen striking reductions in CLASBIs—or in some cases, have even eliminated them. For example, White Memorial Hospital in Los Angeles, California achieved a rate of zero between January 2010 and August 2011 at the 353-bed hospital, while also avoiding pneumothorax complications.

Step 5. Expand use of bedside ultrasound to new applications, such as bedside echocardiography

Our bedside echocardiography programme was also inspired by a clinical challenge, which occurred at 3 AM when a consulting ICU physician, Hargobind Khurana, was called to diagnose a patient in shock. He ordered an echocardiogram, but discovered that no cardiologist would be available to interpret the echo until later that morning. Since the results were needed immediately, to guide treatment of the critically ill patient, he asked a tele-intensivist in our iCare remote access centre to review the scan in real time.

In minutes, with the help of the tele-intensivist, Dr. Khurana was able to accurately evaluate cardiac output and intravascular volume, diagnose the patient and initiate lifesaving treatment. This case demonstrated the need to capture and interpret cardiovascular ultrasound images at any hour of the day or night to guide treatment in real time. Banner decided to partner with the iCare team's 24/7 capabilities, through remote consultation, as a recommended clinical practice for adult critical care.

As part of the bedside echo programme, respiratory therapists were trained to acquire high-quality bedside ultrasound images to transmit to the tele-intensivists remotely. All iCare intensivists were trained in interpreting echo images in real time and using the findings to assess the fluid and cardiovascular status of patients suffering from CHF, shock or other conditions.

In May 2015 the Surviving Sepsis campaign issued an updated, evidence-based bundle of care practices for

patients with severe sepsis or septic shock (Surviving Sepsis Campaign 2015). Bedside cardiovascular ultrasound was one of the recommended methods for evaluating volume status and tissue perfusion, with the scan to be performed with six hours of clinical presentation.

The rationale for implementing bedside echo also drew on studies citing the following benefits:

- Improved diagnostic accuracy;
- Reduced time delays for procedures;
- Superior accuracy in evaluating fluid status in heart failure patients, compared to physical examination techniques;
- Reduced cost for procedures;
- Support for use of ultrasound as the 'third eye' to help the intensivist manage patients;
- Assessment of shock to determine haemodynamic status, fluid resuscitation and interventions.

Step 6: Track ultrasound outcomes—and learn from success

Over the past three years, our health system has avoided any complications associated with central line placement. A key component of this success has been broad engagement of physicians though educating them about safety benefits of ultrasound guidance, including confidence that the needle is inserted correctly with a high degree of first-pass success. In this case, seeing truly is believing—in the power of ultrasound to truly transform the standard of care, particularly for those who need it the most: the critically ill.

Similarly, our bedside echo programme represents an exciting innovation in visual medicine: enhanced ability of intensivists—both at the bedside and via remote access tele-ICUs—to literally see how well the patient's heart is working and response to treatment in real time, allowing rapid adjustments in therapy if needed. As R. Adams Cowley, MD, the pioneering founder of the first U.S. shock trauma centre, famously observed, for critically ill or injured patients, "there is a golden hour between life and death." With ultrasound at the bedside, and the clinical information it provides, physicians are ideally equipped to rapidly help the sickest patients achieve optimal outcomes. ■



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ENTERPRISE IMAGING

SEEKING THE IDEAL IMAGE EXCHANGE VENDORS



Enterprise imaging — the ability to store, view and exchange images from multiple service lines — promises to revolutionise the imaging landscape as growing demand for improvements in diagnosis and treatment is adding pressure to enable and simplify image exchange across the board.

Yet many providers, especially large hospitals and integrated delivery networks (IDNs) are still uncertain on how to move forward, as many do not realise the interoperability potential and often under-utilise their medical image sharing networks.

For its annual performance report, *Enterprise Imaging 2015: Strategies, Options and Vendor Performance*, KLAS Research interviewed 92 providers, who have a clear enterprise imaging strategy, to find out how these early adopters are planning and implementing their enterprise imaging IT strategies and how well vendors perform in an enterprise imaging setting.

KLAS also explored which organisations are employing a consolidated, integrated enterprise imaging approach with a single vendor (or fewer vendors) and which organisations are adopting a best-of-breed strategy.

While many providers have adopted a vendor-neutral archive (VNA), a universal viewer, an image exchange or other technology associated with enterprise imaging, these pieces are often not used as part of a defined enterprise imaging strategy

Centralised Approach Most Popular

Most providers implementing an enterprise imaging strategy adopt a centralised approach, using a VNA as the foundational piece of technology. Advantages of this approach include cost reductions and deeper interoperability (41% of responses), although few have seen cost reductions today. Other providers opt for a federated approach built around a universal viewer (18%). Providers who use this approach say continuity of care is improved and clinicians are more efficient. Satisfaction for both groups of providers is high, and neither approach stands out as more effective than the other.

No Comprehensive Solution Exists

PACS vendors offer key enterprise imaging solutions, including VNAs, universal viewers and image exchange, but there are gaps around specialty-specific functionality, analytics and enterprise content management. No single vendor offers a complete enterprise imaging portfolio, although

Agfa HealthCare, GE Healthcare, and Merge come close, with Merge standing out for widespread adoption and consideration.

Generally, VNAs are used in a single department and primarily serve as a backup in case of data loss. In contrast, those who use a VNA for true enterprise imaging take advantage of additional functionality beyond storage, such as search capabilities and integration into electronic medical records (EMRs), areas where Lexmark stands out positively. Dell Services customers say that their vendor could improve in these areas. In addition, Lexmark, GE, Merge and Fujifilm have live sites for VNAs, with Philips, Dell and Agfa having future VNA plans under consideration.

Web-Based, Zero-Footprint Viewers

As regards universal viewers, most organisations use referential viewers rather than diagnostic viewers, although many providers anticipate that this will change as enterprise imaging becomes more advanced. More and more providers favour web-based, zero-footprint viewers. While these offer less functionality, the ability for use by multiple providers across multiple locations is increased. GE Healthcare in particular is leveraging zero-footprint technology across their customer base (Agfa HealthCare and Merge also offer similar solutions). Vendors with contracted universal viewer plans include GE, Fujifilm, Terarecon, McKesson and Lexmark, while Merge, Agfa and Calgary Scientific have future universal viewer plans under consideration.

The medical image exchange platform lifeIMAGE is highly considered by providers hoping to adopt an image exchange solution. Providers praised lifeIMAGE for their experience with large organisations and consistent development. Other frequently mentioned image exchange vendors included Agfa HealthCare, DICOM Grid, Merge, and Nuance.

The full report, by Monique Rasband, *Enterprise Imaging 2015: Strategies, Options, and Vendor Performance* is available at klasresearch.com. ■



KLAS Research

Orem, UT
USA

+1-800-920-4109

klasresearch.com

@klasresearch

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COMPUTER-DETERMINED INTERPRETATION OF INTRACRANIAL ABNORMALITIES

WHERE ARE WE NOW IN THE ALGORITHM REVOLUTION?



Stephen R. Baker

Professor and Chair
Department of Radiology
Rutgers, The State
University of New Jersey
New Jersey, USA

Editorial Board Member,
HealthManagement

bakersr@njms.
rutgers.edu

Matthew N. Suberlak

Radiology Resident
Department of Radiology
Rutgers, The State
University of New Jersey
New Jersey, USA

The past forty years has been a period of unprecedented and sustained advances in radiology with consecutive innovations expanding our specialty's reach and its diagnostic and therapeutic prowess. Technology has been the midwife of our gains as more and more incisive capabilities have come within our purview. But now we must reckon with the realisation that not every 'improvement' will be placed on our parochial agenda. Some may indeed threaten our primacy even as they effectively improve patient care. The genie has come out of the bottle, so to speak, eager to be deployed insistently and decisively. One instance in which the threshold has been trodden, making the challenge imminent and the disruption clearly evident, is the autonomous application of the computer for the definitive diagnosis of conditions affecting the brain and its coverings.

The integration of computers into our practice over the past twenty-five years or so has been a felicitous development. They have been incorporated into cross-sectional imaging devices, have made possible the telecommunication of pictures as well as words, and have supported the voice generation of reports. The virtues of these accretions to our clinical acumen and our delivery of expertise are undeniable. More controversial has been the conjunction of histologic references with pictographic patterns as evaluated by computers in mammographic analysis. It is this application to which we have affixed the term computer-assisted diagnosis, or CAD.

It is ironic that the first widespread linkage of morphology to cell type with computers has taken place in the context of the diagnosis of breast malignancy. The mammographic image is characterised by a spectrum of shades of white, black and grey, making it difficult to distinguish abnormality from normal, especially in dense breasts. Faint calcifications are also discriminating, but here too some distinctions are not clear cut. Computer assistance, its adherents maintain, helps bridge the gap between two realms of spatial display—macroscopic patterns and microscopic cellular identity. The accuracy of CAD remains a subject for continuing discussion. The problem it addresses is unique—as providing a pathway for future refinements it is not a dead end but rather a cul-de-sac. We must look elsewhere to evaluate computerisation's potential for furthering its integration into imaging interpretation.

And that may now be happening. Recent augmentations in computerisation power in the assessment of Big Data have focused computer-directed analysis in novel ways. The claim

being made now of CT and MR evaluations of intra and extra axial lesions is that an unaided computer investigation can make a diagnostic determination, not merely assist in one. In the breast, computers are meant to link macroscopy with microscopy. In the brain it is morphology alone for what they can now be tasked.

The brain is a rigidly circumscribed, symmetrical organ with clearly delineated parenchymal conformations and intervening and surrounding liquid spaces housed in an unyielding radiopaque shell. It is ideal for the recognition of expansile, constrictive and eccentric abnormalities by experienced interpreters. But now sophisticated computer algorithms, informed by comprehensive databases of the brain, generated in various conditions and at various ages, potentially offer a substitute means of pattern comprehension at least equal to the interpretation of a radiologist.

“COMPUTER ALGORITHMS...
POTENTIALLY OFFER A
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A RADIOLOGIST”

That is the prospect. What to date is the evidence? A first report from Japan in 2005, published in *Radiology*, assessed computer 'assistance' for the diagnosis of intracranial aneurysms by MR (Hirai et al. 2005). Only saccular or fusiform aneurysms alone were assessed. CAD was judged better than radiologist interpretation but about equal with that of neuroradiologists who did not avail themselves of the computer program. In 2010 a small series of patients with either intracranial, subdural, or epidural blood collections revealed equal results by computer alone and by the evaluation of a neurosurgeon (Liao et al. 2010). A retrospective review of a computer algorithm to detect midline shift appeared in another article in 2010 (Xiao et al.). In 53 patients, the results had a sensitivity of 94% and a specificity of 100%.

A more recent report regarding computer detection of stroke lesions at CT showed that CAD proved useful for diagnosis of both haemorrhagic and ischaemic strokes, and better for the detection of haemorrhagic lesions (Gillebert et al. 2014). The authors focused on old atrophic brains. Most recently, in 2015, computer diagnosis was assessed for tissue characterisation of brain tumours by MR (Arakeri and Reddy 2015). This sophisticated program considered shape, texture, wavelet and boundary characteristics. The computerised interpretations equalled that of a neuroradiologist and exceeded the evaluations of two less-experienced radiologists (Arakeri and Reddy 2015).

These reports together reflect the increasing capability of computer determination. We emphasise here the thrust of these studies was for computer determination not assistance. Clearly they betoken a compelling alternative to conventional interpretation by qualified specialists. The payoff could be great for those who can demonstrate that the technique could be made available as a stand-alone exercise.

Furthermore, public perception may also play a role in the ultimate allocation of proprietorship of imaging studies in which computer determination will compete with diagnoses rendered by humans. The musings of opinion makers in the general population are often influential in ultimately directing both the choice of studies and the choice of caregivers responsible for the studies so chosen. A seemingly gratuitous comment in a recent Op-Ed column in the *New York Times* by the noted geopolitical pundit Thomas L. Friedman is germane (Friedman 2015). In an essay about the global agenda facing a new president, he stated: "Robots are milking cows and IBM's Watson computer can beat you at Jeopardy! [an American quiz show] and your doctor at radiology" (Friedman 2015). Or to paraphrase, it will beat your radiologist at diagnosis. So public audiences have been brought into the issue by this comment. Will they soon insist on a computer-determined report as a standard the 'fallible' radiologist may not be able to meet? That sounds perverse perhaps, but once the matter becomes a topic for lay discussion it cannot be ignored.

Moreover, it is likely that existing computer-determined algorithms will improve. A recent announcement by IBM about Watson indicates the company's interest in applying it to imaging (IBM 2015). So where will that situate radiology? For many CT and MR examinations of the brain, computer

determination will be situated initially within radiology's domain. But once it is realised that the computer is doing the diagnostic work and the radiologist is now the manager of the device, and not the interpreting clinician, other physicians might seek to take the business away from us. In the United States, jurisdictional boundaries demarcating specialists' responsibilities are permeable. Neurologists and neurosurgeons could soon realise that the radiologist's interpretation may then become superfluous for routine cross-sectional imaging analysis of the brain. As long as procedure content and volume are directly related to income, they will attract interest from those physicians who regard themselves as conversant if not expert with the technique. For example, interventional neuroradiology, once the province of radiologists, primarily has now become populated in recent training programme classes by neurologists and neurosurgeons, who consider themselves at least as capable as radiologists to meet the subspecialty's challenges.

Hence we must acknowledge and so confront the great changes impinging upon us by the strident march of technology, no longer in step with us, but quite possibly ahead of us, determining the path clinical diagnosis will pursue. Will we stand aside or follow, or find another way to demonstrate enduring value? ■

Key Points

- ✓ Computers have benefited radiology over the last 25 years, including cross-sectional imaging, telecommunication and reporting.
- ✓ Computer-assisted diagnosis has been more controversial as to benefits and accuracy.
- ✓ Computers can now provide analysis of brain morphology equal to a neuroradiologist.
- ✓ Radiologists need to face the possibility of computer-determined diagnosis, and patients may yet prefer it.



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MRI CARE PATHWAY

SUPPORTING A QUALITY MANAGEMENT SYSTEM



Joseph Castillo

Professional Lead
Mater Dei Hospital
Malta
joseph.castillo@gov.mt



Carmel J. Caruana

Associate Professor
Biomedical Physics
Faculty of Health Sciences
University of Malta
Malta

Paul S. Morgan

Honorary Professor
Medical Physics and
Clinical Engineering
Nottingham University
Hospitals
Nottingham, UK

Catherine Westbrook

Senior Lecturer
Faculty of Health, Social
Care and Education
Anglia Ruskin University
Cambridge, UK

Adrian Mizzi

Consultant Radiologist
Medical Imaging Department
Mater Dei Hospital
Malta

In any MRI unit, service quality as experienced by patients depends on the design of the care pathway through which the MRI service is delivered (Johnston and Clark 2005; Yazdanparast et al. 2010). Healthcare organisations can create value in terms of improved service quality by developing expertise, reducing errors, increasing efficiency and improving outcomes (Porter and Teisberg 2004). With an ageing population and rising costs, healthcare organisations have adopted quality management systems (QMS) to improve the effectiveness of treatments and increase patient satisfaction with the service. A QMS is a formal process used to review operations, products and services to identify areas of potential quality improvement. It involves a rigorous, iterative process to continually increase the quality and economic value of services. Creating a quality management system requires a strategic decision, input from employees at all levels of an organisation, and is influenced by varying needs, objectives, the products/services provided, the processes employed and the size and structure of the organisation. The successful implementation of QMS could therefore be hindered through lack of coordination between departments, lack of continuous improvement culture and employees' resistance to change.

A question commonly tackled by radiography managers is: how can a service be managed, controlled, measured, reviewed and improved through the collaboration of all stakeholders (including patients)? One way of contributing to this is through an optimised care pathway design, as the latter is crucial for the attainment of an effective, safe and efficient service (Cheah, 2000).

The European Pathway Association (e-p-a.org) defines a care pathway as:

A complex intervention for the mutual decision-making and organisation of predictable care for a well-defined group of patients during a well-defined period.

The key characteristics of pathways include:

- an explicit statement of the goals and key elements of care based on evidence, best practice and patient expectations;
- facilitation of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team, patients and their relatives;
- documentation, monitoring and evaluation of variances and outcomes; and
- identification of relevant resources.

This project mainly focused on the “facilitation of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team”. Vanhaecht et al. (2010) describe three different coordination models:

- **Chain models:** used for relatively highly predictable care processes with a high level of agreement between the team members;
- **Hub models:** used for less predictable processes with

key persons who lead the delivery of the care process;

- **Web models:** used for highly unpredictable, complex processes.

MRI practice involves a mix of routine and non-routine tasks, where employees need to be able to take initiatives in response to incidental findings, or to optimise processes beyond the confines of standard operating procedures (Ponsignon et al. 2011). The MRI care pathway can be considered as a sub-process that fits a chain model, which permits elements of flexibility.

Within this context if care pathways can be optimised to deliver an effective local service they can also be used to support a quality management system.

A literature search did not locate any studies on the optimisation of MRI care pathways to support a QMS. Discussions with international MR radiographers indicated that such development is often carried out using informal methods, which are highly dependent on what is happening elsewhere,

“IF CARE PATHWAYS CAN BE OPTIMISED TO DELIVER EFFECTIVE SERVICES, THEY CAN ALSO BE USED TO SUPPORT A QUALITY MANAGEMENT SYSTEM”

are rarely reported in the public domain and the validities of which are therefore rarely open to scrutiny; in addition, care pathways need to be specific to local healthcare needs and culture.

The purpose of this project was to bring together a multi-stakeholder, interprofessional expert group to develop further and optimise an MRI care pathway model to support an MRI regional quality management system.

Method

Various techniques were considered for the participation of the multi-stakeholder expert group. A literature survey revealed that multi-stakeholder processes that require consensus techniques include the Delphi, nominal group or focus group techniques (Jones and Hunter 1995; Hutchings et al. 2006; Kitzinger 1995). For this study the researchers opted for the nominal group technique (NGT), because the approach allows an adequate number of MRI stakeholders, who could meet in one sitting and voice their opinions freely. To kick-start the process an initial model of the MR care pathway for adults was developed by a small multidisciplinary group comprising an MRI radiographer, radiologist and medical physicist and forwarded to the participants. This ensured that the participants focused on the actual pathway during the NGT process proper. The NGT method used in this

study is published elsewhere (Castillo et al. 2015).

Seventeen participants, representing radiologists, radiographers, management, medical physicists, policymakers, physiotherapists and nurses working in orthopaedics, neurosurgery and neurology were invited to create a balanced representation of expertise. Ideally the group of participants should also have included patient representatives, but since these are still very much in their infancy in Malta, nurses working in neurology and orthopaedic wards were invited to participate as patient advocates. This had the added advantage that bias resulting from power inequalities between patients and healthcare professionals was avoided (Vaartio-Rajalin and Leino-Kilpi 2011). Ethical approval was received from the ethics committee of the University of Malta. All participants were provided with information regarding the study, and consent was obtained before the start of the NGT.

Results

Fourteen participants accepted the invitation to participate: an executive from the principal public general hospital, a manager from the national Ministry for Health, a service development manager from the allied healthcare professional sector, 2 senior physiotherapists, 3 nursing officers, 3 MRI radiographers, 2 medical physicists and 1 radiologist. The NGT process resulted in ten issues, which were determined by ranking scores assigned by the participants. These are shown in **Table 1** in decreasing order of importance (the latter quantified using a ranking score).

The group gave a strong affirmative answer when asked if the model as presented by the researchers with the additional 10 issues identified through the NGT was sufficient to form the basis of the desired future MR care pathway. The resulting MR care pathway is shown in **Figure 1**. The pathway shows the patient's journey from when he/she is referred for an MRI scan up to the follow-up visit to the referrer. The numbers in brackets (1- 10) in the diagram refer to the NGT-identified issues from Table 1 relevant to that particular section of the pathway. The pathway is divided into various sub-processes at which defined quality outcomes (indicated with an 'O' in the diagram) and associated criteria would need to be inserted.

The following additional suggestions gleaned from the verbatim transcript of the session, which add further support for the main issues of Table 1 were also incorporated into the care pathway (indicated as (a) – (e) in the diagram):

- a. Need for a mechanism to audit the appropriateness of referrals. *"We need to answer the question: has the investigation had an effect on patient management? We are all aware of the high percentage of patients being referred simply because the referrer has no other option - patients insist on an MRI even on occasions when the referrer thinks it is inappropriate."*
- b. Need to educate radiographers on procedures to follow for incidental findings: *"Although there is an electronic feedback mechanism linking radiographers and radiologists this is not always being utilised owing to the large throughput."*
- c. Importance of the introduction of a radiographers' technical report: *"Radiographers should issue a written technical report in which they confirm that the quality of the images was sufficient for diagnosis, and that safety criteria*

Table 1. Final ranking of the ten most important care pathway optimisation related issues as determined by the participants

RANK	ITEMS	REMARKS	RANKING SCORE
1	Safety check at referral stage	This will ensure that any contraindications related to metallic implants are resolved at an early stage, hence eliminating delays on the day of the exam proper (Ferris et al. 2007). Psychological issues that may affect the procedure are brought to the attention of the MRI radiography team in advance (Törnqvist et al. 2006; Grey et al. 2000). This will permit specific anxiety reduction protocols to be employed.	80
2	Education of referrers	MRI education for referring clinicians is necessary to avoid inappropriate requests and better use of MR facilities (Blachar et al. 2006; Lehnert and Bree 2010).	78
3	Establish pre-determined objective quality criteria for evaluation and monitoring at critical stages of the care pathway	Clinical criteria are a standard process adopted by all healthcare organisations that espouse the principles of continuous quality improvement (Busch 2010; Barnes et al. 1994; European Society of Radiology 2002).	77
4	Define in terms of effectiveness, safety and efficiency the meaning of 'quality' for each sub-process of the care pathway.	This would ensure that patients receive effective care, in good time and at fair cost (Campbell et al. 2000).	76
5	Early explanation of the procedure to the patient before coming to MRI	An early explanation of the procedure to alleviate anxiety, and identifying in advance those patients with claustrophobia is very important (Bolejko et al. 2008; MacKenzie et al. 1995). Early explanation also improves compliance.	69
6	Establish local referral guidelines (appropriateness criteria)	Referral guidelines to assist the referring clinician in choosing the best imaging modality. This issue is a precursor to issue 2 (Lehnert and Bree 2010; Blackmore et al. 2011; Rosenthal et al. 2006).	66
7	Transparent prioritisation guidelines	Transparent prioritisation guidelines to ensure urgent cases are scheduled earlier and non-urgent cases are prioritised fairly and in a transparent manner. System must be transparent so that clinicians will not hinder its implementation and so that patients feel that they have been respected (Emery et al. 2009).	65
8	Knowledge of the care pathway by all stakeholders	This would ensure that the care pathway is accepted by all stakeholders and that any subsequent modifications are well understood and accepted by the various stakeholders (Evans-Lacko et al. 2010).	55
9	Patient satisfaction surveys	Patient satisfaction surveys are today considered as an indispensable tool to provide client feedback for further improvement of service quality (Nelson and Niederberger 1989; Ware 2003).	50
10	Urgency criteria for diagnostic results following the scan (flagging)	In particular critical incidental findings need to be brought to attention of referring clinicians immediately (Singh et al. 2007; Ferris et al. 2009).	37

have been met and to record any variance from the original care plan. This technical report would form the basis for audits...."

- d. The use of social electronic media: *"We should use social electronic media for providing early explanation to patients on what to expect during an MRI scan."*
- e. The importance that the referrer qualifies pain levels of patients: *"The referrer should qualify the region and level of pain that the patient may be experiencing. This information would be useful for radiographers to plan the procedure so that the most important sequences are acquired first in relation to the clinical question."*

Discussion

The MR care pathway describes the tasks performed by the various members of the healthcare team as they interact with each other and the patient. The aim is to achieve the desired defined quality outcomes at various stages of the pathway and carry out regular audit to ensure consistent good quality service. The 10 issues and associated quality criteria should be developed into standard operating procedures and included in the QMS. The "remarks" column in Table 1 provides further explanation and discussion relative to the literature, which would also be included in the standard operating procedures.

It is welcome to note the importance given by the participants to patient safety, education of referrers and the communication of urgent and unexpected findings back to referrer (European Society of Radiology 2012). The group has also identified the importance of involving the referrers at an early stage, insisting that the latter should be knowledgeable about the MRI care pathway, and that they should have access to transparent prioritisation guidelines. This would reduce individual barriers to the implementation of the pathway and the quality management system (Evans-Lacko et al. 2010).

Two other important issues are the importance of referral and quality criteria. The Institute of Medicine Committee on Quality of Health Care in America referred to underuse, overuse and misuse of care as safety threats to patients at both the individual and collective level (Institute of Medicine 2001). Only when compilation, disclosure and evaluation of safety and quality indicators with respect to previously established quality criteria occurs, will the quality of clinical

practices be improved (Corrigan 2005). In addition, evaluation should focus not only on end clinical outcomes but also on intermediate sub-processes (Curtis et al. 2006; Von Korff and Goldberg 2001), as proposed in this study. Audit tools in the form of checklists will be developed and used to evaluate key intermediate sub-process outcomes (marked with an 'O' in the diagram) that have major impact on end patient outcomes (Vanhaecht et al. 2006).

The group also raised novel issues. Most importantly for the radiography profession, the group suggested the introduction of a technical report by radiographers that together with the radiologist diagnostic report would provide more complete documentation to the referrer and to management. If integrated within the radiology information system this would certainly facilitate the successful implementation of the pathway (Evans-Lacko et al. 2008; Greenhalgh et al. 2004).

Another novel theme raised by the patient advocates was the importance of referrers indicating the level of pain experienced by patients at the time of the MRI scan request. This would permit radiographers to plan a safer and more comfortable imaging strategy for patients. This important suggestion highlights the capacity of healthcare professionals to act on behalf of patients, and the strength of the NGT method in bringing forth previously unknown issues.

Prior information on the MRI procedure for patients should make better use of interactive information technology. Information about what patients should expect during an MRI procedure would be an effective way of improving the workflow and quality of the service. Although such information is not as widely available as it is desirable, social media

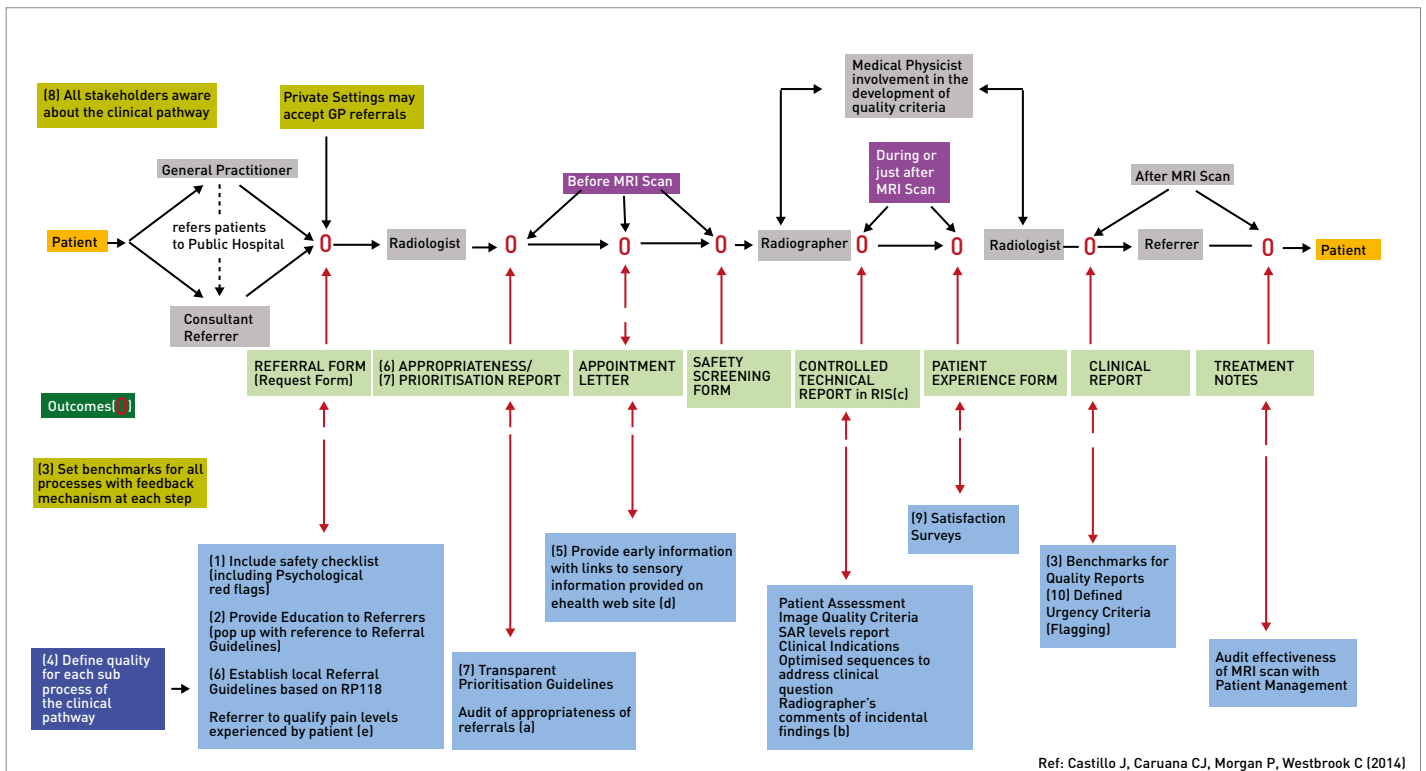


Figure 1. MR Care Pathway



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are already being used by patients to liaise with medical practitioners and acquire timely information (Hawn 2009). In addition, web-based clinical decision support systems could assist referring clinicians with respect to referral criteria (Kaushal et al. 2003; Rosenthal et al. 2006).

The production of a prioritised list of issues may be seen as a limitation given that the method involved focusing only on the top 10 issues and setting aside those of lower priority. However, this limitation was addressed by asking all participants to silently generate their own list of issues and thus ensure that all issues have an equal probability of being placed on the discussion agenda. This procedure avoided significant risk of loss of important data when more assertive members of the group dominate, effectively excluding the views of others. One can expect a high level of confidence that the group listed the most important items that should be integrated in the pathway. In addition, the process of selection and prioritisation ensured that the issues that were most important to the participants received the highest level of attention. Without this mechanism, there would have

been the risk that the discussion be dominated by one or two contentious issues.

Conclusion

This study started from a model of the MR pathway as perceived by a small multidisciplinary group consisting of an MRI radiographer, radiologist and medical physicist, which was in turn subjected to an optimisation process using a nominal group technique. Care pathways are widely believed to be an important tool for ensuring the delivery of high quality, evidence-based care. This paper has presented one example where stakeholders with an interest in MRI and service development came together to contribute to a quality management system. The findings indicate that participants attached the highest importance (rank score >70) to safety, referrer education and defining quality criteria. The NGT method also brought forward novel themes, in particular the need for a radiographer's technical report and the need for referrers to indicate pain levels of patients. The care pathway would provide the necessary data to monitor the service quality. The pathway is considered as a living document and would require periodic ongoing re-evaluation in an iterative process.

Key Points

- ✓ Optimisation of an MRI care pathway by a multi-stakeholder expert group.
- ✓ Introduction of a radiographer's technical report as an assessment of image quality.
- ✓ Establish quality criteria at each step of the pathway for audit purposes.

Note

The complete study has been published elsewhere (Castillo et al. 2015) [dx.doi.org/10.1016/j.radi.2014.09.002](https://doi.org/10.1016/j.radi.2014.09.002)

Conflict of interest: None



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RESOURCE ALLOCATION IN HEALTHCARE

HAVE WE MISJUDGED SOCIETAL VALUES?



Equitable Healthcare

With increased emphasis on financial constraint in healthcare, resource allocation discussions are heard more commonly in clinical departments. As agents of the patient, clinicians are faced with struggles to ensure that individual patients can receive costly treatments, despite growing demands for healthcare throughout society. It increasingly seems as though there is a conflict between the right of the individual to receive treatments, and the rights of society, who pay for it (Bulger et al. 1995). As this conflict grows, we should ask ourselves if the problem is in part due to our failings in understanding public preferences, as we may have misjudged societal values in the allocation of healthcare resources.

Innovations in healthcare have been responsible for a significant improvement in morbidity and mortality, resulting in an estimated seven-year increase in life expectancy between 1960 and 2000 in high income countries (Cutler et al. 2006). This comes at a price, however, as innovations in healthcare require a concurrent increase in healthcare expenditure. EU projections of spending on healthcare suggest that by 2060, average spending for the EU12 countries will reach 9 percent of gross domestic product (GDP) and 8.7 percent of GDP for the EU15 (Pryzwara 2010). Following the turbulence of a global economic crisis, together with rising healthcare expenditure, containing costs appears to have become the goal of both governments and private insurers. Yet in the face of rising costs and discussions about the sustainability of current levels of healthcare expenditure, it is even more important that decisions about necessary levels of spending, and how these resources should be distributed, should include the values of those who pay for it. Societal value judgments play an important role, now more than ever, in ensuring that the provision of healthcare is fair and equitable (Daniels 2013).

However, in reality society's opinion is rarely included. In areas of resource allocation within healthcare, the opinions of the public have consistently been shown to be different from those of healthcare professionals and politicians (Kinnunen 1998). In the emotive world of resource allocation in healthcare, we tend to assume that in order to provide care for an individual, we prevent other members of the public from accessing this care. In doing so we forget about the benefit that society gains through acts of altruism. In essence, we forget that society cares for the individual. Following are the steps through decision-making in resource allocation, which draw attention to the possibility that healthcare professionals may be wrong in assuming that we must trade off care for one against care for many. Furthermore, Big Data may have a role to play in helping us determine true societal values.

Equity-Efficiency Trade-Off

Fair resource allocation relies on the determination of an equitable and efficient trade-off, and is a focus of welfare economics. This trade-off can be long term, that is a trade-off between current and future generations, or it can be in the shorter term, between those requiring healthcare at a given point in time. The concern of all stakeholders is how to fairly balance the delivery of finite resources to one individual, therefore decreasing available healthcare for the rest of society. This balance is referred to as the equity-efficiency trade-off (Investopedia 2016). However, even the use of the term "trade-off" ignores the fact that society can benefit from delivering care to individuals. We know that individuals derive a benefit from altruistic deeds, including blood donation, cadaveric organ donation and indeed stranger-to-stranger living organ donations (Steinberg 2006). We can assume that society and the public care about others' health, as demonstrated by the importance of healthcare on the political agenda, and the degree of funding delivered to medical charities (Hanson 2008). While economists argue that the most appropriate perspective for economic analyses is societal (Byford and Raftery 1998), the reality is

“WE MAY HAVE UNDERESTIMATED THE DEGREE TO WHICH THE PUBLIC CARES ABOUT INDIVIDUALS”

that while the costs taken in these equations are societal, the benefit gained by society, from helping individuals, is not included in economic analyses within healthcare. In fact we examine benefits that accrue to the individual patient, their family or their community. If an equity-efficiency trade-off is required to appropriately distribute healthcare, then the preferences of and benefits to the public matter in determining how to allocate resources.

Agency Relationship

Decision-making in healthcare is undertaken by clinicians, who act as agents for the patient. Blomqvist went even further in describing them as triple agents in the delivery of resources, as they act for the patient, for society and to some extent in a self-interested way as their own agent (Blomqvist 1991). An additional agency relationship exists between society and policymakers, whose role should be to act in the best interests of the public. However, while both



Fiona Kiernan

Consultant
Intensive Care Medicine
Beaumont Hospital
Dublin, Ireland
fionakiernan@rcsi.ie

clinicians and policymakers appear to have similar stated beliefs regarding the optimal allocation of resources in health-care, these differ from the opinions of the public. Evidence from Australia comparing the attitudes of various stakeholders within the healthcare system showed that doctors and the public differed in their attitudes to managing a healthcare system that was under substantial pressure due to costs (Robertson et al. 2011). For example, the public were more likely than doctors to believe that drug companies and lobby groups were responsible for increasing medical costs. However, the public were also more likely to believe that increasing costs were due to patients failing to take responsibility for their own health. In addition, fewer doctors than patients believed that the doctor should be responsible for educating the public regarding healthcare costs (Robertson et al. 2011).

In the face of such discrepancies in values, is the position of the policymaker and clinician as an agent of society untenable?

Measuring Societal Preferences

Rather than relying on an agent to understand societal values, perhaps we should rely on public opinion instead? This builds on the idea that decisions taken by a large group may be better than those taken by a small group, even when that small group is composed of experts (Surowiecki 2004). One

of the major concerns with using societal/ public preferences is how to accurately measure them. We need to pay particular attention to how data regarding these preferences is obtained, as accurately measuring areas of public opinion is fraught with methodological concerns. Using survey questions targeted at a representative cross-section of the population to rank the priority of various health policies may appear, at first, to be a reliable source of data. Through surveying we can determine the stated preferences of that sample. However, using these stated preferences conflicts with aspects of both theoretical and experimental economic research, which suggests stated preferences do not represent true value judgements. For example when consumer choice is examined, the stated preference (the purchase a consumer tells us they would make) is less reliable than revealed preferences (the actual purchase they make) (Wardman 1988). Economists tend to reject the use of stated preferences in favour of revealed preferences. Studies examining the differences between stated and revealed preferences in health-care have shown a discrepancy between the two groups, although they have mainly focused on willingness to pay studies (Blumenschein 2001).

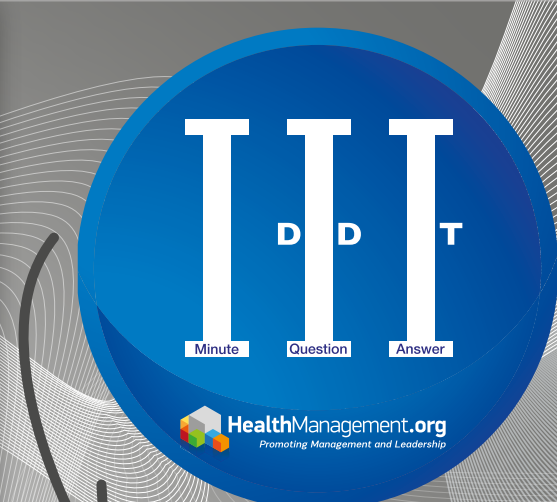
Social Media as a Measure Of Preferences

While it is relatively easy to determine an individual consumer's revealed preference for an individual purchase, examining

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the revealed preferences of a society for the distribution of a public good is clearly a different and more difficult scenario. Public discourse plays an important role in democracies, not only in forming values, but also in reflecting them (Della Carpini et al. 2004). Both the act of talking as an individual in public and conversations with fellow citizens allow the expression of views, the development of shared concerns and preferences, and enable society to reach a consensus about matters of public concern (Chambers 1996). Perhaps more importantly, though, analysis of the most common topics of public discourse can show us what is of most concern to the public.

Increasingly people turn to social media to document events and issues that concern them, and in doing so they provide us with a real-time account of issues that concern the public. Social media monitoring has the ability to quantify positive and negative reactions to policy, including health policy. Analysis of social media is now a well-described method of analysis of public opinion (O'Connor et al. 2010), and allows unheard voices to enter the process of discussion of both policy and politics (Anstead and O'Loughlin 2015), of which resource allocation in healthcare is undoubtedly a feature. This is not a new use of social media content. It has previously been used to assess public responses to long-term political problems, including economic downturn (Gonzalez-Bailon et al. 2010). Along with public opinion, public mood can also be captured by analysis of social media, demonstrated by analysis of a Twitter feed in a study from the University of Bristol (Lansdall-Welfare et al. 2012). In this study, the researchers identified four key moods — anger, joy, fear and sadness — and linked these moods to words. They noticed that words associated with joy were particularly evident at Christmas, while words associated with a negative mood

were found in mid-October 2010. The researchers noted that this corresponded to a time of large cuts in public spending. Furthermore, anger appeared to increase around the time of the summer riots in London in August 2011.

However, using Big Data methodology to analyse public opinion carries its own risks. The social value judgments recorded are likely to represent only a proportion of the population. According to the Oxford Internet Survey, social media users, in particular Twitter users, tend to be young, well-educated, and live in urban areas (Dutton et al. 2013). Analysing tweet data alone does not take into account the values of those who choose to engage by following the conversation, rather than entering it. Furthermore the number of tweets discussing a subject may not relate to the number of Twitter users who care about the issue — in an analysis of 26,000 uses between February and December 2011, it was found that 1 percent of users accounted for two thirds of tweets (Bruns, & Burgess 2012).

Conclusion

A combination of stated and revealed preferences may be the most acceptable means of determining social values. However, as healthcare professionals involved in resource allocation decisions, it is time for us to realise that what we consider to be a conflict between the right of the individual to healthcare and the right of society to those same resources, may not be a conflict for society itself. We may have underestimated the degree to which the public cares about individuals. Big Data has given us the opportunity to include revealed preferences in the equity-efficiency trade-off. Despite the uncertainty that it brings, we should welcome its inclusion in making decisions about resource allocation in healthcare. ■



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EFFECTIVE LEADERSHIP IN THE 21ST CENTURY

KEEPING THE TEAM ENGAGED



Jacqueline Jones

Radiology Manager
East Alabama Medical
Center, Opelika, Alabama

Jackie.Jones@eamc.org

Leaders know how to achieve goals and inspire people along the way. While the terms and definitions may change with the times, Jacqueline Jones writes in *Radiology Management*, Journal of the AHRA, that it is important to understand the skills and abilities needed to lead in the 21st century.

Definition of Leadership

Leaders will each influence at least 250 people in their lifetimes (Kehler 2010). People influence others by what they say and do, and through how they do their work.

Webster defines leadership as the power or ability to lead other people. In the 1950s, Peter Drucker said, "Leadership is not magnetic personality that can just as well be a glib tongue. It is not 'making friends and influencing people,' that is flattery. Leadership is lifting a person's vision to higher sights, the raising of a person's performance to a higher standard, the building of a personality beyond its normal limitations" (Drucker 1993).

Unfortunately, leadership does not have a one-size-fits-all definition. Every leader has ideas about what it means to be effective. Although the definitions may vary, the general attitudes remain the same, and that is leaders are people who know how to achieve goals and inspire people along the way (Helmrich 2015).

Leadership in Imaging

Many in the imaging industry know someone who is highly intelligent, highly skilled, and gets promoted into a leadership role only to fail at the job. Others may know someone with solid technical skills, but not extraordinary intellectual abilities who gets promoted into a similar position and is successful. A leader may be a CEO of an organisation or a first year employee who leads the team to success from behind the scenes. A leader may lead through official authority and power or through inspiration, persuasion, and personal connection. It is not just the formation of results that makes a great leader.

Most effective leaders have one element in common, and that is they are able to keep their teams engaged. If team members are not engaged, they may very well leave the organisation (Goleman 2004). The ability to lead effectively is based on a number of skills.

Communication

Leaders must fine-tune their communication skills. Good leaders tend to be excellent listeners and are able to listen

actively and gather information. Sam Walton, Founder of Wal-Mart once said, "The key to success is to get out into the store and listen to what the associates have to say. Our best ideas come from clerks and stock-boys. It's terribly important for everyone to get involved" (Khad 2012).

Motivation

Inspiring others is a practice of an effective leader. Motivation is best done by example and guidance and not by giving orders. One of the primary goals of a leader is to attract and retain motivated employees. Effective leaders do not lead by telling people what they have to do. Instead, effective leaders are catalysts and they inspire the staff to want to help.

“THE ‘DO AS I SAY, NOT AS I DO’ PRINCIPLE DOES NOT WORK FOR ADULTS ANY BETTER THAN IT WORKS WITH CHILDREN”

Vision

Leaders are visionaries. Leadership pioneer and guru Warren Bennis said, "Leadership is the capacity to translate vision into reality."

Visionary leadership can act as a catalyst and provide the inspiration needed to spark the performance of others. It looks beyond the conventional role of a leader and embraces a forward thinking attitude and envisions the future (Farmer 2008).

Modelling

Modelling is the leader doing what he or she expects the workers to do. If team members are expected to speak respectfully to each other, the leader must speak respectfully to the team. "Do as I say, not as I do" does not work for adults any better than it works with children. If team members are expected to be on time for meetings, then the leader must always be there a few minutes ahead and begin exactly on time, every time, no exceptions.

Demonstrate Empathy

Empathy simply means understanding and compassion. Leadership does not require adopting staff emotions or trying to please everybody. Rather, it simply means to thoughtfully

consider employees' feelings along with other factors in the process of making a decision. Empathetic leadership results in relationships where leaders truly understand their followers, and demonstrate concern for their wellbeing and growth (Wim 2011).

Confidence

Confidence is the cornerstone of leadership. Leaders can be taught problem solving skills as well as decision-making abilities. They can also be educated on how to become better communicators, coaches, mentors, and at holding team members accountable. Yet, without confidence, leadership will exist in title alone. Part of the job of the leader is to put out fires and maintain team morale. The leader has to maintain confidence and assure everyone that setbacks are natural. The important thing is to focus on the larger goal.

Know Your Strengths

Leaders must do their jobs on the basis of their strengths. In order to be a successful leader in the 21st century, leaders need all of their team members to reach their goals. Each employee has some of the vital skills needed to get there, but effective leaders must surround themselves with people to bridge any gaps.

Persistence

Great leaders must be persistent. Mother Teresa was determined. Margaret Thatcher was determined. Steve Jobs was persistent. He experimented with many pursuits before starting Apple Computers. The key to being a good leader is endurance and not quitting.

Integrity

Integrity is the core of everything that is successful. Tom Peters, noted co-author of *In Search of Excellence*, said: "There is no such thing as a minor lapse of integrity." Leaders cannot take a hiatus from integrity. Minor lapses in integrity set a tone of disrespect for people, products, systems, customers, distributors, and relationships and can readily become pervasive. Therefore, leaders must remain honest and truthful in their action (Dortch 1998).

Adding Value

Leaders add value to their organisations and employees by concentrating on activities that create actual value for the organisation. They add value through investing in what creates worth, whether it is people, systems, or equipment. While systems and equipment are important, it is essential that leaders first focus on the people. Without people, there are no operations.

Conclusion

Today, leaders are faced with many challenges in running organisations. Over the past 50 years the definitions, descriptions, expectations, and styles of leadership have evolved and will continue to do so. What was true concerning leadership in the past may no longer hold today, and what is true today may not be so in the future. Even so, leaders must be in tune with their teams and be willing to adjust with the times. ■

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Ph: 800-334-2472, info@ahraonline.org, ahraonline.org



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STEERING THE INTEGRATION AGENDA

STABLE LEADERSHIP NEEDED



Shirley Cramer

CEO
Royal Society
of Public Health (RSPH) &
Institute of Healthcare
Management (IHM)
London, UK
SCramer@rsph.org.uk
ihm.org.uk
@IHM_tweets

Service Integration

Overcoming barriers between the health and care sectors to achieve service integration has been the goal of successive UK governments over many decades, although its four countries have chosen different pathways and timescales to reach it.

While Northern Ireland was first past the post and can offer 46 years of experience in what challenges are being faced in attempts to bring the sectors together at present, Scotland, Wales and England are all now pushing forward the integration agenda with increasing urgency.

In Scotland, the government (Public Bodies Act 2014) sets out the legislative framework for integration, allowing Health Boards and Local Authorities to integrate health and social care services in two different ways. They can either delegate the responsibility for planning and resourcing service provision for adult health and social care services to an Integration Joint Board or opt to take the lead responsibility for this themselves.

The Scottish Government has made a clear statement on what it means by integration:

Integration is not an end in itself. It will only improve the experience of people using services when we all work together to ensure that we are integrating services as an effective means for achieving better outcomes. When we refer to “integrated health and social care”, we mean

**“ RISKS WILL HAVE TO BE TAKEN
- EVEN ENCOURAGED - IN THE
KNOWLEDGE THAT SOME FAILURES
WILL RESULT ”**

services that are planned and delivered seamlessly from the perspective of the patient, service user or carer.

Last year the Welsh Government allocated an extra 20 million pounds to the existing 35 million pounds which was invested in 2014-15 in schemes to enhance integrated working by health and social care services. The focus in Wales has been on improved outcomes for older people and helping address the pressures on unscheduled care. The

government claims some success already in reducing unnecessary hospital admissions.

In England the biggest experiment in integration, dwarfing all other models, is “Devo Manc”. In March last year, in what has been sold as a trailbreaking move, Greater Manchester and the National Health Service (NHS) England signed a memorandum agreeing to bring together health and social care budgets – a combined sum of 6 billion pounds. The initiative saw NHS England, 12 NHS Clinical Commissioning Groups, 15 NHS providers and ten local authorities agree a framework for health and social care, with plans for joint decision-making on integrated care a key target (Manchester City Council 2015).

It is too early to judge the achievements of England’s other appointed pioneers in integration, now numbering 25. The pioneers, encompassing a broad range of health and care economies ranging from large urban populations in cities such as Leeds or London to the rural counties of Worcestershire, Staffordshire and Cheshire, have varying ambitions. What they have demonstrated to date is a strong commitment to innovation and recognition of the need to engage in a degree of risk-taking.

The arguments for effective health and social care integration from a patient perspective have been made and won. An ageing population, often with complex co-morbidities, requires well-coordinated care from different professionals, services and organisations. Fragmentation leads to gaps, which in turn delivers poorer outcomes.

However, lack of finance is the issue which currently dominates every discussion on health and care, with the NHS charged with making 22 billion pounds efficiency savings by 2020 and social care budgets under pressure as never before. When people’s needs are not met by the social care system, which is an increasing reality in the current climate, their dependence on the NHS increases. The common example is elderly people kept in hospital because of a delayed assessment, care home place, home care package or home adaptation.

Aside from improved patient experience, the government is also eyeing integration as a way of unlocking desperately needed savings in the system. However, evidence from international studies to date suggests that there is no guarantee that financial benefits will materialise.

Supporting and extending the concept of new models of care are the “vanguards”. The first 29 vanguard sites chosen fell into three categories: integrated primary and acute care systems; enhanced health in care homes; and multi-specialty,

community-provider vanguards. These were closely followed by eight urgent and emergency vanguards and 13 acute care collaborations, the latter aiming to link local hospitals together to improve their clinical and financial viability (NHS 2015).

Obstacles and Openings

The blocks to successful integration (and indeed many new models of care) are well recognised. With the exception of Devo Manc with its shared budget, they include the differences which exist in the way health and care services

However, as a recent Institute of Healthcare Management (IHM) snapshot survey revealed (2015), leadership continuity is seriously under threat; half of 18 CEOs from its membership were considering quitting their post within the year. Of these, only one was looking to find an alternative position within the NHS, with the remainder seeking alternative employment in another sector or private healthcare, or opting for early retirement.

The reason for this disillusionment is not hard to find. The dilution of central interference promised by the 2012 reforms of health and social care has failed to materialise. Instead, today's leaders are dogged by a growing burden of regulation and inspection, an increased degree of political exposure and a blame culture that should long ago have been consigned to the history books.

Yet there could surely be no better time to focus on the leadership that health and social care needs to produce the stability in the system on which successful integration depends. Leaders in both sectors deserve more support if they are to stay the course, using their skills to bring people together to collaborate in a shared vision for the future.

Risks will have to be taken — even encouraged — in the knowledge that some failures will result. Those failures, in turn, will need to be honestly acknowledged without fear of blame or retribution. And greater recognition must be given to those who lead the way in difficult and troubling times for healthcare. ■

“STRONG RELATIONSHIPS TAKE TIME TO BUILD AND EXCELLENT, STABLE LEADERSHIP IS KEY TO CREATING VISION, TRUST AND SHARED VALUES”

are commissioned and funded — particularly the latter — along with the varying methods of governance, regulation and accountability, exacerbated by the Health and Social Care Act 2012.

That said, the ingredients needed in a move to integrated services have also been identified. In 2014 a report on the progress of the initial English pioneers at the end of their first year of operation highlighted “overwhelming evidence” indicating that the key to successful transformation was “strong relationships which enable leaders to overcome organisational boundaries for the benefits of the whole system” (NHS England 2014).

The report went on: “Where it is working well, it is not because of changes imposed nationally. It is through local leaders at all levels — clinicians, health and care workers, managers and patients — taking bold steps to move away from traditional ways of working which may benefit their own organisation but be to the detriment of the whole system.”

Strong relationships take time to build and excellent, stable leadership is key to creating vision, trust and shared values and to breaking down traditional silos and changing cultures.



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SELF-ASSESSMENT FOR HOSPITALS

ACTION PLANNING USING ACCREDITATION GUIDELINES IN A MULTISPECIALITY HOSPITAL



Piyali Mitra Mathavan

Assistant Professor
School of Management Studies
Swami Rama Himalayan University
Jolly Grant
Uttarakhand, India
piyalimathavan@srhu.edu.in

Quality accreditation can provide a sustainable competitive advantage to healthcare businesses if they build their strategy around creating infrastructure, policies and processes compliant with the Indian National Accreditation Board for Hospitals & Healthcare Providers (NABH) standards. The standards promote adherence to global best practices of healthcare delivery, and there are detailed guidelines on measuring performance of hospitals on pre-defined quality indicators (nabh.co/standard.aspx). Accreditation requires an organisational culture change, which needs to be sustained for a longer period of time. A culture developed on the bedrock of quality care and patient safety will provide utmost quality assurance to patients and the community. Patients have become more aware about accreditation, and they are basing their choice of hospital on whether the hospital is accredited or not.

NABH Standards for Hospitals

The 10 chapters reflect two major aspects of healthcare delivery, ie patient-centred functions (Chapters 1-5) and healthcare organisation-centred functions (Chapter 6-10), as follows:

Patient-Centred Standards

- Access, assessment and continuity of care (AAC);
- Care of patients (COP);
- Management of medication (MOM);
- Patient rights and education (PRE);
- Hospital infection control (HIC);

Organisation-Centred Standards

- Continuous quality improvement (CQI);
- Responsibilities of management (ROM);
- Facility management and safety (FMS);
- Human resource management (HRM);
- Information management system (IMS).

Aim

This project aimed to conduct self-assessment against NABH accreditation standards, gap analysis and action planning at a leading multispeciality corporate hospital of north India. Secondary objectives were to:

- Study the efficient functioning of the Hospital, area-wise and department-wise to ascertain that the standard operating procedures are being followed in an accurate and effective manner.

- Ascertain the organisation's preparedness and commitment to quality goals and conformance to accreditation standards.
- Understand the effectiveness of employee satisfaction indicators on implementing NABH processes.
- Suggest effective solutions through action planning that the hospital can adopt to bridge such gaps.

Methods

This was an observational study that involved collection of primary data via structured observation tools, staff and patient interviews, studying the standard operating procedures (SOPs) of the department and putting the observations on the audit tool. The areas that were considered and studied empirically were:

- Patient care areas: outpatient department (OPD), inpatient department (IPD), day care centre, operating theatres, intensive care units.

“A CULTURE DEVELOPED ON THE BEDROCK OF QUALITY CARE AND PATIENT SAFETY WILL PROVIDE UTMOST QUALITY ASSURANCE TO PATIENTS AND THE COMMUNITY”

- Support areas: nursing stations, diagnostics (laboratory and radiology), pharmacy;
- Ancillary service areas: central sterile supply department (CSSD), food and beverage, laundry, engineering services, biomedical engineering, medical gases, biomedical waste management (BMW) and medical records department (MRD);
- Administrative areas: executive offices and other non-revenue generating units;

Table 1. Compliance by Chapter

Standard - Objective	Compliance Status	Related to	Score	Remarks
Chapter 1 Access, Assessment and Continuity of Care (AAC)				
AAC 1. The organisation defines and displays the services that it can provide	Partial Compliance	Infrastructure	5	Emergency paediatrics/neonatal and high-risk services for obstetrics are not displayed anywhere
AAC 4. Patients cared for by the organisation undergo an established initial assessment				
The organisation defines the timeframe within which the initial assessment is completed based on patient needs	Partial Compliance	Process and Manpower	5	The defined timeframe for initial assessment is not uniformly adhered to in many of the cases sampled
The initial assessment results in a documented plan of care which is monitored	Partial Compliance	Process and Manpower	5	Not evidenced, documented and implemented
The plan of care also includes preventive aspects of the care where appropriate	Non- Compliance	Process	0	The preventive aspects of care are not being documented in any of the case files sampled
Chapter 2 - Care of Patients (COP)				
COP 1 - Uniform care to patients is provided in all settings and is guided by the applicable laws, regulations and guidelines				
The organisation adopts evidence-based medicine and clinical practice guidelines to guide uniform patient care	Partial Compliance	Process	5	There is scope for adopting evidence-based practice in labour ward, nursing, pre-anaesthetic check-ups and clinical practice
COP 2 - The ambulance services are commensurate with the scope of the services provided by the organisation.				
Equipment is checked on a daily basis using a checklist	Partial Compliance	Manpower	5	Daily checklist for ambulance cleaning not filled. Gauzes packed near expiry and L-junction packed without date of manufacturing and sterilisation
Emergency medications are checked daily and prior to dispatch using a checklist	Partial Compliance	Manpower	5	Emergency medicines are not checked prior to dispatch
COP 3 - Documented policies and procedures guide the care of patients requiring cardiopulmonary resuscitation				
Staff providing direct patient care are trained and periodically updated in cardiopulmonary resuscitation (CPR)	Partial Compliance	Manpower	5	Staff needs to be trained in latest CPR guidelines
A post-event analysis of all cardiac pulmonary resuscitation is done by a multidisciplinary committee	Partial Compliance	Process	5	The corrective and preventive measures are not evidenced to have been taken post-CPR analysis
Corrective and preventive measures are taken based on the post-event analysis	Partial Compliance	Process and Manpower	5	Not all code blues are being analysed by CPR committee.
COP 4 - Documented policies and procedures guide nursing care				
There are documented policies and procedures for all activities of nursing care	Partial Compliance	Process	5	There is scope for adopting evidence-based practice in nursing practice
These reflect current standards of nursing services and practices, relevant regulations and purposes of the services.	Partial Compliance	Process and Manpower	5	Nursing care plans are not individualised, do not assess the outcome of care or include discharge planning
Nursing care is aligned integrated with overall patient care	Partial Compliance	Process and Manpower	5	Nursing care plans do not assess the outcome of care in relation to the patient's clinical condition
Care provided by nurses is documented in the patient record	Partial Compliance	Manpower	5	Missing in some case files
COP 5 - Documented procedures guide the performance of various procedures				
Informed consent is taken by the personnel performing the procedure, where applicable	Partial Compliance	Process and Manpower	5	Informed consent is taken by the JR[Surgery] in majority of the cases
COP 6 - Documented policies and procedures define rational use of blood and blood products.				
Informed consent is obtained for donation and transfusion of blood and blood	Partial Compliance	Process	5	Consent is being taken, but in very few cases for every transfusion. In all others, it is a one-time consent
COP 7 - Documented policies and procedures guide the care of patients in the Intensive Care and High Dependency Units				
A quality assurance programme is documented and implemented	Partial Compliance	Process and Manpower	5	Lacks both documentation and implementation
The organisation defines and displays whether high-risk obstetric cases are cared for or not	Partial Compliance	Infrastructure	5	The high risk services for obstetrics are not displayed anywhere
COP 8 - Policies and procedures guide the care of paediatric patients				
The organisation defines and displays the scope of its paediatric services	Partial Compliance	Infrastructure	5	Paediatrics/neonatal services are not displayed anywhere
COP 9 - Documented policies and procedures guide the care of patients undergoing moderate sedation				
Informed consent for administration of moderate sedation is obtained	Partial Compliance	Process and Manpower	5	Use of abbreviations, blanks left for why the procedure is being done. Surrogates completing the form do not mention their name and relation with the patient
COP 10 - Documented Policies and procedures guide the administration of anaesthesia				
Informed consent for administration of anaesthesia is obtained by the anaesthetist	Partial Compliance	Process and Manpower	5	Anaesthesia Consent Form found incomplete in procedure name, doctor name, time of patient and doctors' signatures and name of the witness in some cases
COP 11 - Documented policies and procedures guide the care of patients undergoing surgical procedures				
Patient personnel and material flow conforms to infection control practices	Partial Compliance	Process and Manpower	5	There is a mixing of clean and infected cases of Ortho Operation Theatre
COP 12 - Documented policies and procedures guide appropriate pain management				
Documented policies and procedures guide the management of pain	Partial Compliance	Process	5	Policies and procedures need to ensure that accuracy of pain assessments and reassessments are done
All patients are screened for pain	Partial Compliance	Process	5	Not followed in all cases
Patient with pain undergo detailed assessment and periodic re-assessment	Partial Compliance	Process	5	Pain assessments and reassessments are not followed by appropriate modification of plan of management

The other chapters have been dealt with similarly, and the results may be obtained from the author.

Table 2. Standards and Objective Elements with Self-assessment Toolkit Score Less Than 10

Chapters	Standards	Objective Elements
AAC	9/ 14	15/16
COP	15/17	24/24
MOM	4/4	12//4
PRE	3/3	4/4
HIC	6/6	11/11
CQI	6/6	11/11
ROM	4/4	11/11
FMS	6/6	13/13
HRM	5/6	7/7
IMS	5/5	11/11
Total	63	119

Scoring Pattern

- Score 10/10: 100% compliance to the requirement.
- Score 5/10: Partial compliance to the requirement (if any of the sample is found to be non-compliant out of total samples selected).
- Score 0/10: Non-compliance to the requirement.
- NA: Not applicable.

Findings and Data Analysis

The following tables show partial and non-compliances with remarks about the actual observations of the gap for selected standards.

Gaps in Compliance

Infrastructure-related gaps form the lowest percentage (seven percent) followed by manpower gaps (thirty-three percent). The highest percentage of non-conformances (sixty percent) is process-related. Some non-conformances are both process-related (lack of documentary evidence) and manpower related (lack of implementation). These have been added separately under both headings thus increasing the total number to 134.

Employee Satisfaction Evaluation

Table 4 shows the employee satisfaction level (in percent) for each parameter by calculating the mean percentage of the individual questions under each parameter. The overall employee satisfaction rate was 73 percent.

Discussion

A thorough analysis of areas of non-compliance to the NABH standards revealed that infrastructure-related gaps are 7

Table 3. Other ten mandatory CQI Indicators which also had to be collected and the findings monitored periodically

Sno.	Standard	Indicator	Formula	Sample Size	Dec	Jan	Feb
1	CQI3c	Incidence of medication errors	Total no. of medication errors x 100/Number of patient days	2% of patients/day	1.4	1.2	2.4
2	CQI 3f	% transfusion reactions	Number of transfusion reactions x 100/Number of transfusions	NA	0.18	0.2	0.1
3	CQI 3g	Urinary tract infection Rate	Number of urinary catheter-associated UTIs in a month x 1000/ Number of urinary catheter days in that month	NA	0	1.5	0
4		Pneumonia rate	Number of "VAPs" in a month x 1000/Number of ventilator days in that month	NA	0	4.5	1.4
5		Bloodstream infection Rate	Number of CLABSIs in a month X 1000/ Number of central line days in that month	NA	6.5	4.8	4.4
6		Surgical site infection (SSI) rate	Number of SSIs in a given month x 100/Number of surgeries performed in that month	NA	0	0.0	0.2
7	CQI 4b	Incidence of Falls	No. of falls x 100/Number of discharges and deaths	NA	0	0.06	0.05
8		Incidence of bed sores after admission	Number of patients who develop new/worsening of pressure ulcer X100/Number of discharges and deaths	NA	0	0	0.32
9	BOR	Bed occupancy rate	BOR= Number of inpatient days in a given month x 100/Number of available bed days in that month	NA	65	69	83
10	ALOS	Average length of stay	ALOS= Number of inpatient days in a given month/ Number of discharges and deaths in that month	NA	4.5	5	4
11	CQI 4f	Incidence of needle stick injuries	Number of parenteral exposures x 100/Number of patient days in that month	NA	0.06	0.07	0.01

CLABSI Central line-associated blood stream infection CQI Continuous quality improvement VAP Ventilator-associated pneumonia.

“ THE PROCESSES NEED TO BE CLARIFIED AND STRENGTHENED AT THE TOP-LEVEL FIRST AND THEN HANDED DOWN TO THE STAFF FOR EFFECTIVE IMPLEMENTATION ”

percent, manpower gaps are 33 percent and process-related gaps the highest percentage at 60 percent. Overall compliance observed is 89.9 percent and non-compliance is 10.1 percent. The upside to these findings is that the improvements can be made with only a little investment of financial resources since the non-conformances that require infra-structural modifications and enhancements form the lowest percentage.

Next Steps

The processes need to be clarified and strengthened at the top-level first and then handed down to the staff for effective implementation. The core team and sub-committees will include members from lower and middle management positions to translate the actual flow of activities into SOPs. This will help to minimise the difference between achievable and absolute levels of performance. The ideal approach is to seek suggestions from front-line staff on policy formulation and revision since they are the ones who practically face the actual difficulties in on-the-ground implementation. However, this does not cast any form of doubt on the successful process of the time-tested patient care system that has been in place in this hospital since its inception. NABH is merely an enhancement of these processes to conform to national and international standards.

Table 4. Employee Satisfaction Evaluation - Average Satisfaction Level for Each Parameter

S.No	Parameter	Average Satisfaction Level
1	Your Job	73%
2	Your workplace relations	74%
3	Future Orientation	83%
4	Reward and Recognition	40%
5	People policies	71%
6	Participation	70%
7	Training and Development	83%
8	Value System	73%
9	Communication	81%
10	Decision-making	73%

The above table represents the *employee satisfaction level* (in percent) for each parameter by calculating the mean percentage of the individual questions under each parameter.

Conclusion

It can be stated with confidence that these enhancements can be made as per the NABH requirement details outlined in the NABH Manual. The study findings have indicated a strong positive association between the NABH process implementation and employee satisfaction. Though the overall percentage of employee satisfaction is calculated to be 73 percent, the employees at this hospital see conforming to standards as an additional burden.

Since the staff has to actively participate in the implementation of both patient-centred and organisation-centred standards, it is perceived as an imposed responsibility rather than a voluntary commitment to quality. ■

Key Points

- ✓ How can hospitals assess their quality dimensions.
- ✓ Ten chapters in the articles reflecting both the patient-centred functions and healthcare organisation-centred functions have been demonstrated.
- ✓ Study ascertains the organisation's preparedness and commitment to quality goals and accreditation standards.
- ✓ Understand the effectiveness of employee satisfaction indicators on implementing the accreditation processes.





SOCRATES

AN ELECTRONIC EVALUATION SYSTEM TO ADVANCE MEDICAL TRAINEES



Orpheus Kolokythas

Senior Consultant, Radiology

orpheus.kolokythas@ksw.ch



Rene Patzwahl

Senior Consultant, Radiology

Matus Straka

Radiology IT Consultant

Christoph Binkert

Professor of Radiology
Director and Chairman

Department of Radiology
and Nuclear Medicine
Kantonsspital Winterthur
Winterthur, Switzerland

Developing thorough competency in both specialty and professionalism is of pivotal importance for radiology trainees. Residents and fellows are challenged by uncertainty and limited experience early in their career, by volume overload in daily routine and by hierarchical structures within departments. At the same time trainees are expected to develop clinical competency and an adequate level of professionalism that allows them to interact with supervisors, colleagues, staff and patients respectfully and effectively. While teaching and learning form the essence of education, formalised evaluation by consultants (U.S. terminology: attending physicians) and self-assessment has not been standardised in many European educational medical institutions.

Objective feedback and assessment during education and support of this development process may be hampered by absence of precise directives, uncertainty about how to apply assessment criteria and by lack of objectivism and professionalism of consultants. While feedback is defined as the immediate informal response to an action or behaviour, evaluation represents a formalised way of assessment. A structured evaluation process for medical trainees might be supported and recommended by national educational authorities; the implementation of a standardised system with defined criteria applicable specifically to an adequate assessment of trainees however may vary greatly between institutions, if implemented at all. Objective tracking of personal development might be jeopardised by lack of motivation of consultants, communication problems and lack of efficient standardised evaluation processes.

Evaluations may thus result in non-objective, irregular and non-representative assessments that do not aid the advancement of trainees. In the end personal professional education may become deficient with detrimental effects on patient care, personal development and the public's view of healthcare professionals.

Project Objective

Training for radiology and nuclear medicine residents at our institution, currently numbering 13 radiology residents, has been a well-structured programme with precisely defined rotations by modalities, daily teaching sessions and formalised lectures, yielding resident satisfaction consistently at or slightly above average according to the Swiss Institute for Medical Education (SIWF). As the supervising authority the SIWF conducts annual surveys on the quality of the teaching institutions by sending out standardised questionnaires to all residents. The forms are filled out voluntarily. Individual answers of participating residents are not published; the results for each institution however are posted publicly on the website siwf.ch in German or French.

While our department consistently scored above national average for the years 2011, 2012 and 2013 on a six-point scale in the categories "overall assessment" and "implementation of evidence-based medicine", in other disciplines such as "teaching culture", "learning culture and feedback", "leadership", "error and safety", "decision-making" and "communication" our programme reached average or only barely above average marks. Further internal observations revealed a lack of regular consultant-to-trainee feedback. No regular and standardised evaluation system was in place that would be based on direct input by more than one supervising physician; a formalised self-assessment tool was not available. In addition no formal support or guidance for professional behaviour and development existed.

Our goal was to develop a digital evaluation system that allows regular, structured, and transparent evaluations of residents, with the aim to improve self-reflection and objective assessment of trainee performance and professionalism.

“REGULAR, STRUCTURED, AND
TRANSPARENT EVALUATIONS OF
RESIDENTS”

System Development and Concept

A configurable intranet-based evaluation system was developed that allows consultants and trainees to rate performance and professional behaviour using a standardised scoring system. We named the system SOCRATES after the ancient Greek philosopher (469 BC – 399 BC), whose method of dialectic inquiry and logical conclusions for the purpose of problem-solving is considered fundamental to the approach of philosophical and scientific thinking in European and other cultures. The ancient philosopher is also cited in Plato's Apology with his famous statement "The unexamined life is not worth living", by which he stresses the importance of reflection and critical examination of man's own life.

At the same time we used "SOCRATES" as an acronym for "Standardized Online Competency Review and Advancement of Trainee Evaluation System", which also describes the approach and purpose of the tool.

The system is highly configurable and may be used for various medical specialties and other healthcare professions.

We have configured the program to fit the needs of a radiology residency programme, but many other configurations are possible. Our version includes 7 categories for assessment:

- Knowledge;
- Patient care;
- Report creation;
- Technical skills;
- Professionalism;
- Personal effort;
- On-call performance.

These categories contain several criteria, each pertinent to the field. Each is to be addressed by a six-point rating scale and additionally with free text comments that all department consultants are encouraged to give (Fig. 1). Specific justifying comments are not only appreciated, but also expected, if exceptionally poor or good marks are given. Consultants give scores anonymously, while free text comments are identifiable. However, this is one of many options where transparency can be modified.

A self-assessment module, containing the same categories and criteria, is displayed next to the consultants' assessment for comparison of results, once trainees and consultants have completed the evaluation independently of each other. User access can be adjusted to allow for adequate transparency and confidentiality at the same time. For example modality (area)-supervising radiologists have access to results of their area only, while the residency programme director and institutional director have access to results of all areas. A dashboard allows for a quick overview of evaluations to be completed (Fig. 2).

We chose to use a rotation schedule and review process based on areas, which are mostly imaging modalities, but also modality-independent specialties such as emergency or paediatric radiology. However, the evaluation form is the same for all rotations. We determine the rotation schedule for the entire year upfront, during which residents switch rotations on a quarterly basis; monthly, semi-annual or annual evaluation periods are possible. Evaluations are available electronically to be filled out via a personalised account by accessing the institutional intranet during or after each rotation. Additional email reminders are sent out at the end of each quarter, and a deadline is set shortly after each quarter by which all entries have to be completed, in order to allow for timely analysis of results.

Horizontal tracking of individual results in comparison to all other residents allows a quantitative and qualitative assessment of individual performance and is plotted in diagrams (Fig. 3). Longitudinal comparison of personal performance and development over time can be displayed for one modality and in comparison to other areas, when rotations are repeated over time (Fig. 4 and 5). Charts also show the comparison between self-assessment and consultants' review (Fig. 6).

Quarterly discussions between modality supervisors and residents are conducted individually and confidentially to ensure timely communication of results, provide support and give directions for further development and improvement

Figure 1. Example of an Evaluation Form

Here the department chair evaluates a first year resident in his second CT rotation; portrait data of the resident are listed in the breadcrumb trail, which is updated for every evaluation period automatically, while the evaluation below is the same for every evaluation period, unless the department is changing its configurable content. Scores from 1 to 6 may be given; comments are optional. In this example only the first category ("Knowledge") is depicted (names and content of this screenshot are modified for confidentiality).

Figure 2.

Screenshot of the evaluation system showing dashboard view for the department chair: hyperlinks in the central section of the header allow viewing of evaluations results for all modalities and are accessible to the programme director and department chair only.

Further below appears the table with the list of residents that are to be evaluated for a specific period by the chair, who is responsible for and assessing residents in MR, but who is also involved in rotations such as CT and paediatric radiology in this example, for which he is evaluating the listed residents' modules (names and content of this screenshot are modified for confidentiality).

All consultants have access to their own password-protected user accounts that display similar tables for residents who were supervised by them; the residents' user interface listing self-assessments, and optionally consultant assessments, looks similar except for the header, which obviously does not contain areas of responsibilities.

of performance. Annual reviews, which are mandatory by the SIWF, occur between residency programme director and the individual resident to integrate results of the year in the overall assessment and plan within the training programme and to determine a potential need for adjustment in the rotation schedule or for other modifications.

Evaluations can be saved electronically or printed out by the supervisors along with an automatically generated date and time stamp, signed by resident and supervisor and filed to the resident's institutional record. Another copy may be signed for the resident's personal record.

Impact

One year after implementation of SOCRATES there was uniform agreement amongst residents and consultants that the system was reliable and easy to use. No technical failures occurred. A "save for later" function allows for the evaluation process to be paused in a busy routine with no loss

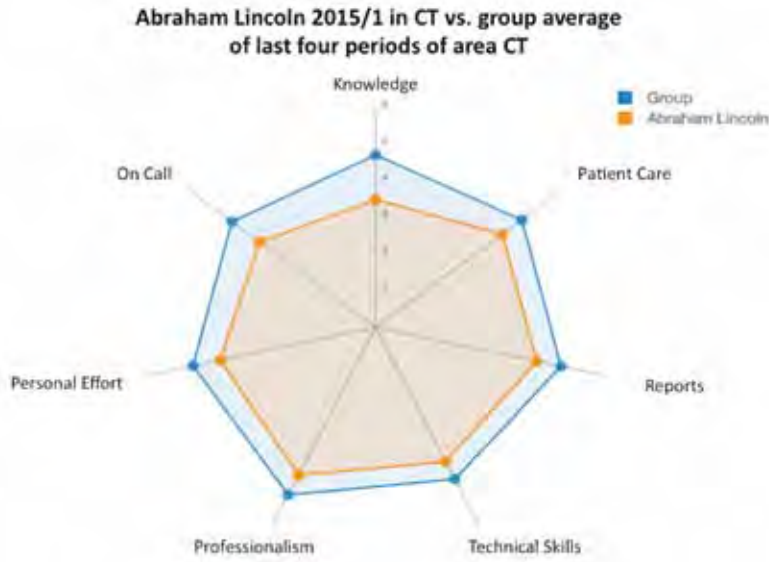


Figure 3. Spider web plot of a 2nd year resident in his second CT rotation (name and data modified for confidentiality). The results show lagging of performance and professionalism by 0.5-1.5 points in all categories when compared to the group of fellow residents at the same institution.

On-call performance is evaluated separately from the modality-specific categories on each rotation, but is also listed on a quarterly basis; for reasons of practicality it is discussed with the modality supervisor of the same period. In this case on-call performance is lagging behind the group average and more inquiries would have to be made to investigate the source of this weakness.

CT Trend 2015/1 – Abraham Lincoln vs. group average

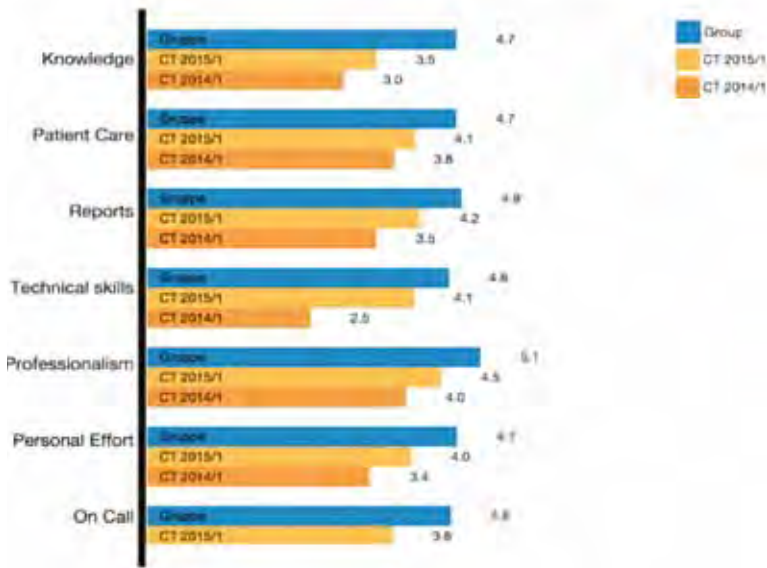


Figure 4. Diagram showing trend of the second CT performance of a 2nd year resident (name and data modified for confidentiality) compared to group average: despite a noticeable gain in all categories, this resident still has to do quite some catch up work to reach the departmental average.

of information. However, the process is usually quick, taking between 3 and 15 minutes for each trainee, depending on the length of the individual comments given.

The annual Swiss national satisfaction survey 2014 showed a noticeable increase in the rating for “regular feedback” from 5.0 in 2013 to 5.9 points in 2014 on a six-point scale (max. 6.0), compared to 5.1 points national average, raising our department in the entire category on “learning culture” from 5.1 points in 2013 to 5.6 points in 2014, compared to

“WE ARE CURRENTLY ALSO EVALUATING THE RESULTS OF THE OPTIONAL CONSULTANT EVALUATION MODULE”

5.2 points nationally. No other measures were implemented during the year other than the evaluation system, along with instructions on how to use it, so we relate at least part of this improvement to the use of the new system.

Also other categories such as “Decision Making” and “Error and Safety” were rated higher: Marks for “Error and Safety” increased from 5.2 to 5.6 points, compared to 5.0 and 5.2 points nationally between 2013 and 2014. Even though it is probably not as self-explanatory as “regular feedback” is for the explanation of the improvement of results, the system might have had an influence on how trainees are being informed of errors and how they reflect on them once errors are documented and analysed in a standardised system. However, SOCRATES is not a documentation system for logging operational errors, nor are we using it to rank residents; all results are kept confidential. For its second year of use in 2015 the repeated annual survey revealed steady results, which encouraged us to continue use of the programme in the future.

At the time of submission of this manuscript the system is being implemented at several radiological institutions in Switzerland. We are currently also evaluating the results of the optional consultant evaluation module for 2015, which allows residents to assess all consultants anonymously in order to improve teaching based on constructive feedback without the fear of negative impact for the residents. The consultant evaluation module contains a different set of evaluation criteria than the resident assessment tool, including teaching effectiveness, motivation to teach, resident support, professionalism and other. It is filled out annually, although the evaluation period as well as all the criteria may be modified as well. To guarantee confidentiality and prevent misuse of conduct, this survey, in contrast to the resident assessment tool, is completely anonymised including



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Abraham Lincoln in MR 2014/3 vs. in other areas

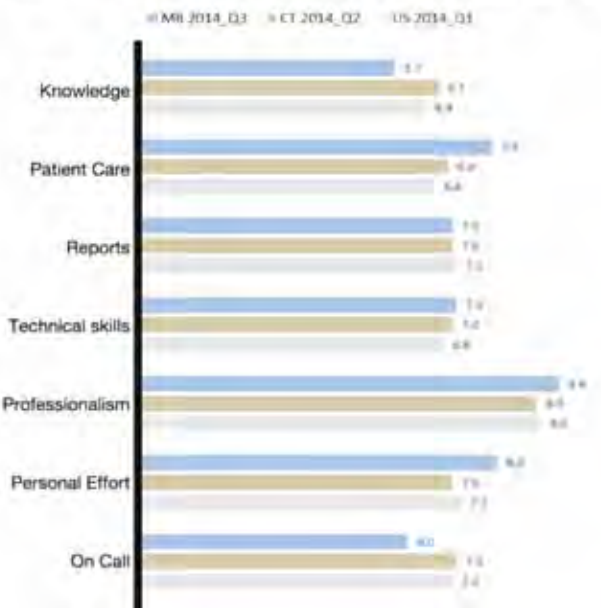


Figure 5. Comparison of a 2nd year resident's first MR rotation with his previous rotations in CT and ultrasound: Knowledge in MR is weaker even on his second MR rotation than for CT and ultrasound, despite good personal effort. Patient care and professionalism have been excellent throughout all three rotations and need no additional corrective initiatives at this time (name and data modified for confidentiality).

comments given by the residents, so that no user, including users with a system administrator's function, may be able to unveil the identity of residents or timeline of submitted evaluations. Consultants have access to their individual results, compared to the group average. Access to these results may also be customised for others, such as institutional or programme directors.

Both the resident and consultant assessment tool are accompanied by separate help pages that provide guidance to the user on how to fill out the evaluation forms. The resident page also gives suggestions on how to conduct the summative periodical discussion and demonstrates with screenshots mocked up examples what the result pages will look like (Figs. 3-6). The help pages can be edited as well to include for example institutional conventions or to post rules or agreements on the conduct of the surveys etc.

During its two years of use SOCRATES has become an integrated part of our residency programme and is being received as a constructive feedback system that is easy to use with very acceptable effort for both residents and consultants. The system may be easily configured to suit the requirements not only of medical specialties other than radiology, but also for other healthcare professions such as nursing or technical staff. ■

Self-assessment vs. consultant evaluation CT 2015/1



Figure 6. Discrepancy between a second year resident's self-assessment after his second CT rotation and consultant evaluation, which is represented by the baseline ("0"). The aim is to detect substantial discrepancies between the two assessments rather than determining absolute values of performance. We consider discrepancies between self-assessment and consultant evaluation of less than one point negligible on a 6 point scale, so this resident seems rather overconfident in all categories (name and data modified for confidentiality).

Key Points

- ✓ Medical residents benefit from regular self-assessment and feedback through supervisors.
- ✓ Residency training programmes may benefit from standardised regular evaluation of trainees.
- ✓ Electronic evaluation systems allow for structured assessment and documentation of performance and professionalism in medical educational and other educational healthcare programmes.



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STOCKHOLM SCIENCE CITY FOUNDATION

HAGASTADEN



Stockholm is cranking up the volume when it comes to life science opportunities. For healthcare, for the life science industry and for researchers. But most importantly – for you and me as future or current care recipients.

The city is currently in the process of transforming a former railway depot into a flourishing life science arena. The area is strategically located in the city of Stockholm within walking distance of academic institutions such as Karolinska Institute, the Royal Institute of Technology (KTH), Stockholm University, Stockholm School of Economics and the Science for Life Laboratory (SciLifeLab). In addition, this new part of the city, named Hagastaden, will bridge the adjacent cities of Stockholm and Solna, where Karolinska Institute along with a large number of life science companies are located, and is built over two major highways. All this will pave way for a new city district with residential areas, parks, culture, commercial spaces with a focus on life science, and the brand new Karolinska University Hospital.

The location, ease of communication and collaborative environment has already attracted authorities to Hagastaden, which is today home of the European Centre for Disease Prevention and Control (ECDC), the Public Health Agency of Sweden, the Swedish Agency for Health Technology Assessment and Assessment of Social Services, and the Swedish eHealth Agency.

Well, all this sounds great, but haven't we heard this story before? Major investments (seven billion euros to be specific), major infrastructural improvements and enthusiastic politicians. What is unique in Stockholm and why is this project happening now?

First of all, the baseline: Hagastaden is not emerging from empty facilities and high expectations. We are starting in a region where some 700 life science companies are situated, whereof 75 are located in the middle of Hagastaden. Secondly, Sweden has a long-standing history and good reputation in collaborative science, which have resulted in healthcare blockbusters such as the proton pump inhibitor omeprazole, in medtech devices such as the Gamma Knife® and the pacemaker.

As an increasing share of pharmaceutical research and development moves into biological medicines, the Stockholm region is gaining power within this field. Strong positions in the field of protein research as well as production of biopharmaceuticals have generated a strong industry for Sweden ever since Arne Tiselius and Theodor Svedberg won the

Nobel Prize almost a century ago (Norrby 2010). In 2015 the Stockholm region's exceptional competence and know-how have attracted a number of investments, both nationally and internationally. Placing hopes and investments in Hagastaden and the greater Stockholm region is not a coincidence.

In May 2015 AstraZeneca announced plans to invest approximately 285 million dollars into a new hi-tech facility for manufacturing of biological medicines in their site south of Stockholm. The new facility will supply medicines for clinical trial programmes of AstraZeneca and MedImmune from the end of 2018, and will deliver finished products for commercial use once fully operational by 2019.

In December 2015 GE Healthcare Life Sciences announced a 100-million-dollar investment in its facility in Uppsala, a city in the Stockholm region, to double manufacturing capacity for chromatography media. Today GE Healthcare's Uppsala facility produces 250 different types of chromatog-



Anna Frejd

Marketing and
Communication Director
Stockholm Science
City Foundation
Stockholm, Sweden
anna.frejd@ssci.se

“ PLACING HOPES AND INVESTMENTS IN HAGASTADEN AND THE GREATER STOCKHOLM REGION IS NOT A COINCIDENCE ”

raphy media, which are used in the purification of more than 90 percent of all biopharmaceuticals approved by the U.S. Food and Drug Administration.

Only a week later the Knut and Alice Wallenberg Foundation, Sweden's largest private research funding body, along with AstraZeneca and three Swedish universities, declared that they would invest 55 million dollars into a protein research centre focusing on mapping proteins, which are secreted by cells and identifying new protein-based targets for compound development as well as developing new methods for production of therapeutic proteins. Simultaneously the Swedish government is to provide another 35 million dollars for open calls within protein research and development of biological therapeutics.

These investments (475 million dollars in total) are proof of the region's strength within protein research and



Illustration of what the future holds at Hagastaden

Sweden Statistics (2013)	
Total population	9,571,000
Gross national income per capita (PPP international \$)	44
Life expectancy at birth m/f	80/84
Probability of dying between 15 and 60 years m/f (per 1,000 population)	69/43
Total expenditure on health per capita (Intl \$)	4,244
Total expenditure on health as % of GDP	9.7

Source
World Health Organization (2013) Sweden Country Statistics who.int/countries/swe/en/

manufacturing of biopharmaceuticals and will also secure Stockholm's future position within the field of life science in general and protein science in particular.

Hagastaden is already a hotspot in this context, and with ongoing development it will be the place for highly specialised healthcare and the workplace for some 50,000 people. It will also be home for even more people as 6,000 new flats are to be built, and a place for culture and recreation for many. The corner pillars of Hagastaden are based on healthcare, industry, academia and city residents. It will be a flourishing part of our capital pulsing with life 24 hours a day, seven days a week. In 2025, Hagastaden will be fully developed, but who knows, maybe the next Svedberg or Tiselius is already here? ■



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“Articulate a common purpose for the team you lead”



KIMBERLEY APPLGATE

PROFESSOR OF RADIOLOGY, EMORY UNIVERSITY

What would you single out as a career highlight?

Mentoring talented women and men in their developing careers (medical school, training, junior faculty), has been a rich and rewarding experience. I have enjoyed watching them learn, teach me, and succeed in so many ways.

“It is health that is the real wealth and not pieces of gold and silver” - Gandhi



ASEEM MAHOLTRA

AWARD-WINNING CARDIOLOGIST

What is your top management tip?

Good management is the art of making problems so interesting and their solutions so constructive that everyone wants to get to work and deal with them. Engage, listen, act. There is no monopoly on wisdom.

"Be Realistic. Demand the Impossible!" Che Guevara



SANDEEP BANSAL,

FOUNDER AND CEO AT MEDIC CREATIONS

What would you single out as a career highlight?

I'm leading a company developing technologies that will help re-imagine global health communities through shared experiences and knowledge to transform care. I'm looking forward to exploring the future potential to help enable many healthier, happier lives.



SIMONA AGGER GANASSI,

CHAIRMAN, EUHPN - EUROPEAN HEALTH PROPERTY NETWORK

“To him who does not know to which port he is steering, no wind is favourable.”

What is your top management tip?

Never be tired of explaining the reasons behind your strategy, evaluations and decisions. Nothing is well explained until it is well understood. In the meantime do not act as if only you have “the truth in your pocket”. Have strong leadership, but be open to listen to people who work in the field, no matter what their level in the hierarchy of management.

The full Zoom On interviews with these and other healthcare leaders can be found online at healthmanagement.org or scan the QR codes

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