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# Turning the Silver Tsunami into a Silver Lining ...

**H**ealthcare is becoming more and more successful, allowing us to endure into an unprecedented old age. At the same time, in developed countries, the fertility rate is lowering. These two phenomena have led to what international organisations have been saying for years: the population is getting older. Now, the question of the ageing population is no longer a theoretical scenario earmarked for the future; we are engaging in the present – in the welfare state, the labour market, and in healthcare.

Growth isn't plateauing either; the rate of ageing is gaining momentum with the proportion of the globe's population aged over 60 years projected to continue rising from 12% in 2015 to 22% in 2050 (WHO 2018).

To meet this challenge, head-on, all nations, from emerging to established economies, must undertake a significant shift in their healthcare systems on both a micro and macro level.

Is healthcare ready to deal with the ensuing economic impact, pressures on sustainability of existing systems, need to adapt service delivery, and the broader implications of public health? How can technology be leveraged horizontally and vertically in the healthcare spectrum to accommodate the older patient? Is

healthcare in denial about how ageist it is and how can management address such an entrenched and self-defeating stance? How can we go to the core of frailty and heal it before it develops? Does pharma have the answer on slowing down the ageing process altogether and can we learn anything about healthy ageing from 'Blue Zones,' the spots in the world with the highest percentage of octogenarians? Are we ready and willing to redesign healthcare?

In Silver Tsunami, expert contributors provide insight into the question of ageing from multiple healthcare perspectives. A silver lining is ahead: healthcare will be transformed and become more people-centred.

Elsewhere, we look at how Brexit could impact healthcare and how physicians can lead change effectively when the focus is on patient-centred healthcare. The merging of imaging and AI through a meeting of practical needs and bold innovation is also in the spotlight.

We hope this journal offers insights that take your practice to the next level. Let us know your news and views. ■

*Happy Reading!*



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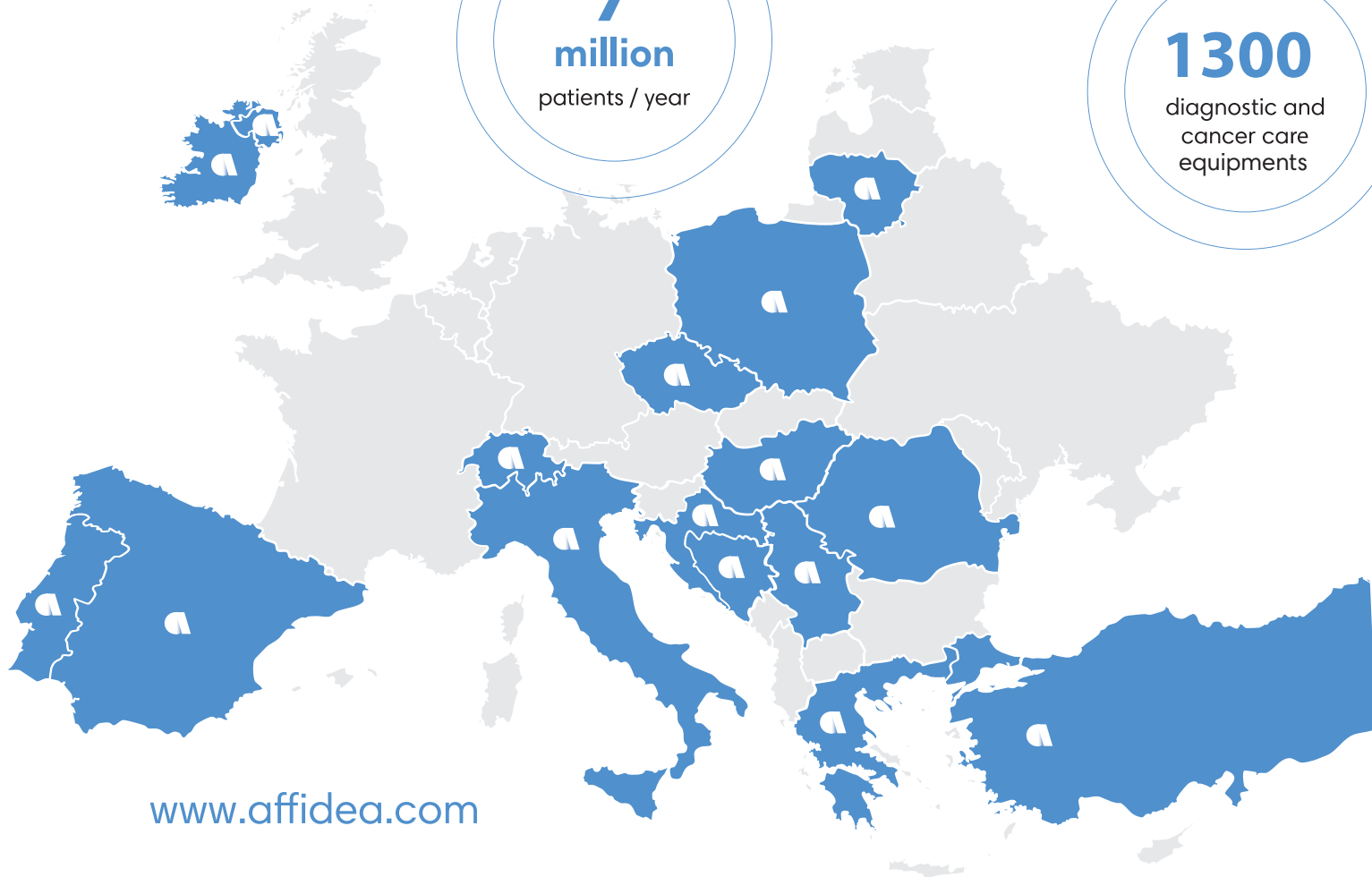
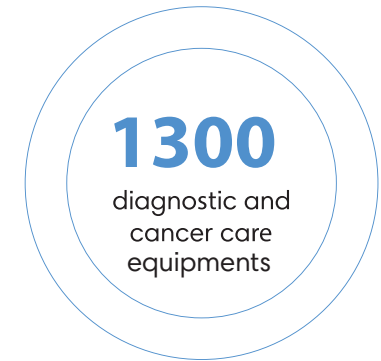
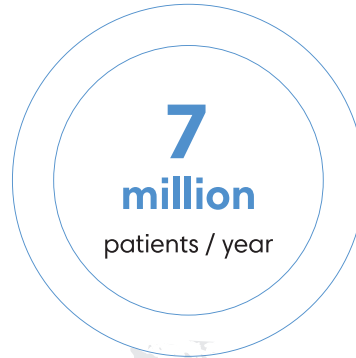
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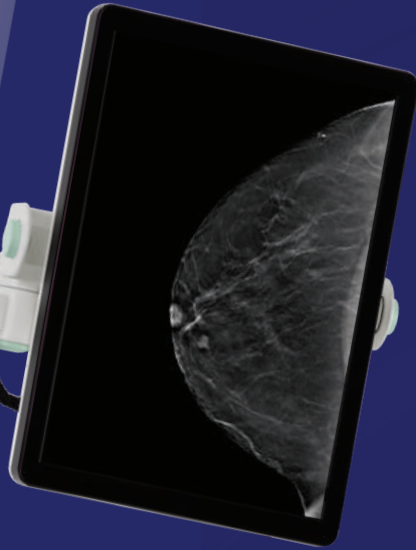


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# EUSOBI 2019

About 1000 breast Imaging professionals are meeting this October for the EUSOBI Annual Scientific Meeting in Budapest. Congress organiser, Gabor Forrai spoke to HealthManagement.org about what's in store and the organisation's ambitions for the future.

## What are some of the key challenges in the field of breast imaging and how will these be addressed at the EUSOBI Annual Scientific Meeting being held in Budapest in October?



There is always the challenge of tomosynthesis. Since its inception around 2011, it has become a major method but there are always fresh studies coming out. At the EUSOBI congress, we will focus on contrast-enhanced (spectral) mammography (CESM), a methodology which is much more recent than tomosynthesis. No method replaces another one outright; it's like we're working on a puzzle with more and more pieces helping us to improve diagnostics.

We also have at least four sessions about clinical-related issues such axilla, multidisciplinary teams, follow-up and staging. Of course, there will be a lot of lectures and workshops and the keynote lecture is about AI – an area which is having a huge impact on Imaging.

## As this year's meeting organiser, can you detail the highlights of the event? In the 12 months since the Athens congress, have you noticed any new trends or concerns emerging in breast imaging?

A theme that is increasingly taking centre stage in breast Imaging is risk-based screening or

personalised screening. This means that the screening details concern the given patient's risk factors like the personal breast density and such factors. I anticipate this will continue to be a hot topic for breast radiologists.

Fortunately, our society and perspective is always multidisciplinary so we cannot speak about risk and risk-based issues without clinicians. We have oncologists and epidemiologists, working close together with us and these are problems that we have to solve in cooperation with them.

Additionally, there have also been multiple studies coming out about nipple discharge, which is a symptom of a possible underlying cancer. The role of MRI was emphasised by a recent publication. This issue won't be in the spotlight during the Budapest congress but it's worth noting that it represents a new trend as does Automated Breast Ultrasound (ABUS).

As far as other new developments towards better care are concerned, this year is bigger and more about the relation of imaging and therapy. For example, there is a session called 'Imaging in the Role of Breast Cancer Treatment' and in this session, we will speak about reduced therapy based around imaging — for example, omission of radiotherapy based on MRI findings. Also, we will speak about minimally-invasive treatments or

interventional therapies, meaning vacuum excision and so on. Small circumscribed lesions can already be excised with a big needle without the need of surgical exploration and general anaesthesia. We are performing more such interventional therapies, so breast radiology is no more only a diagnostic method but also a therapeutic method. There are also some experimental studies for cryotherapy that means freezing the lesions for malignant lesions. This is all very interesting as this is one of the trends that radiologists would carry out themselves without the need for a surgical intervention. This would mean no general anaesthesia and no lengthy hospital stays.

## What can delegates expect from the Multi-disciplinary Team (MDT) sessions? Are there any new developments towards better care?

I will moderate the ever-popular MDT sessions where we will discuss some very interesting and challenging cases - especially those that arise during routine daily work.

We have collected and will discuss significant cases covering pathological, oncological and surgical interests and specialities. Some cases have never been seen before which we will discuss in a live discussion. This is as it would be in a good team meeting in a good hospital. People observe how discussion should, ideally, be carried out when cases

are interesting and where MDT members are motivated and have a high knowledge. It's a good example for the participants because, of course, they are not all working in huge university institutes where MDT work can be seen. This really is a challenge.

### Regarding the 'Novel Developments' session, what is exciting you the most?

We will have a lot of interesting presentations in this session, probably featuring some machines which very few people would have, only very high university departments. It will take a while until these Mammi-PET and PET MRI will go into the daily practice. But one among them, AI, is in daily practice or is about to go to daily practice quite soon – that's my belief – so this is the most exciting issue - AI.

### EUSOBI is growing and forging new partnerships. What are the benefits of being part of a breast imaging network?

We founded the national societies network that encompasses the national breast imaging/breast radiological societies from each country in Europe and a little bit beyond. We meet regularly every year during the annual meetings where we discuss different trends and specialities from different member countries. It's incredible how breast imaging in different nations can differ so widely, even in Europe. We study protocol, knowledge, where training is needed and where there is a shortage of equipment. There are EU countries where some MRI-guided biopsies are never performed because there is no equipment and no knowledge for them. There are some others where there is not enough equipment or personnel. There are countries where there is no shortage and there are countries where it is difficult to find breast

imaging services. We discuss these issues and try to exchange productive information.

EUSOBI organises courses for different countries according to local demand and need. For example, in Romania we have been running special courses tailored to their requirements. There is the concept that we are a European society, but we have to keep in touch and build good relations with national societies beyond our shores.

### What is the thinking behind the new EUSOBI Young Club Symposium?

The EUSOBI Young Club is a great success story. We have a lot of young radiologists (up to 40 years of age) who are very active in research and publishing, daily work and in networking. The Young Club chair is part of the EUSOBI board and they undertake special tasks such as the social network and website issues since, generationally, they are more accustomed to this work than more experienced breast radiologists.

This year's Young Club symposium focuses on the theme "Being a breast radiologist: Beyond the clinical work." One day we will be replacing the board with these young people because they are growing, learning and producing more and more interesting material. It's a good idea to build a younger generation with close connection to the actual board.

### Finally, what developments do you hope to see in breast imaging before the 2020 congress?

I don't know whether we will see this in the 2020 Congress, but I personally would like to see the prototype of a machine that combines mammography and automated ultrasound because it would bear the advantage of both screening methods and diagnostics plus the opportunity to fuse the images.

I'd also like to see more MRI breast screenings and diagnostics in the world. We have observed that in a rising number of cases, we need breast MRI and pre-operative breast MRI. For example, there is a huge study going on called the MIPA study which we are participating in alongside a large number of professionals connected with EUSOBI. I hope that one day the protocols say that we must do a breast MRI before treatment because such a practice is ideal for pre-operative exploration.

### How will delegates be able to relax in Budapest?

We will have a beautiful EUSOBI evening event. We have a boat trip on the Danube during dusk which will give people the opportunity to meet and chat. This is also one of the goals of a congress; it's not all science but also scientific and personal connection. ■

## KEY POINTS



- Trends in tomosynthesis, AI and Imaging and multidisciplinary teams will be in focus during EUSOBI 2019.
- 'Being a Breast Radiologist: Beyond the Clinical Work' is the theme for the EUSOBI Young Club.
- Cross-border networking amongst breast radiologists is beneficial for insights into colleagues' challenges and solutions.

# Vendor-Driven Standards for Interoperability

David Hancock, the healthcare executive advisor at InterSystems, was recently elected vendor co-chair of INTEROPen, a UK collaboration that promotes open standards for interoperability in the health and care sector. HealthManagement.org spoke to David about why he wants INTEROPen to be vendor-led and how this approach will help both suppliers and the health and care ecosystem.



## What is INTEROPen, and why has it grown so quickly?

INTEROPen is a collaborative that was set up three years ago to promote the development and adoption of open standards for interoperability in health and social care. There were seven founder members, of which InterSystems was one, but there are 350 organisations involved today.

I think INTEROPen has grown so quickly for two reasons. Firstly, because the focus of National Health Service (NHS) policy has been to create integrated health and care organisations to shift care closer to the patient. Secondly, because we have known for a long time that the greatest risk of a gap in care opening up, or of poor-quality care being delivered, is when a patient is passed from one provider or professional to another and they can't share information because they use different systems. Both require the IT systems that organisations use to "talk to each other" as health and social care secretary Matt Hancock puts it. And the way to get systems talking to each other is to make sure they use standards to code and structure and exchange data in the same way.

## How is the leadership of INTEROPen changing?

This summer, there was an election for a new vendor co-chair, which is the position I now hold. I will co-

chair the monthly INTEROPen board meetings with my colleague, Luke Readman, who works in the NHS as the senior responsible officer for the One London local health and care record exemplar.

I will also work with three other vendor representatives who sit on the board of INTEROPen, who come from Cerner, Orion Health and System C. The aim is to make INTEROPen more vendor-led, while still being in dialogue with the NHS and standards organisations, so we can all achieve wins together.

## Why do you want INTEROPen to become vendor driven?

Until now, INTEROPen has tended to focus on working with NHS Digital and with NHS organisations to define standards. It still needs to do that, because it needs to make sure that the work it is doing is the work that health and care needs to be done.

But it also needs to shift its focus to adoption. It's not enough to define standards; we need to be able to plan for their success, so we can reduce the time it takes to get to a critical mass of adoption. The most important way to do that is to get standards built into vendor products.

Health and care organisations purchase a lot of commercial, off-the-shelf solutions, and they

purchase a lot of integration engines to help them exchange information with each other. If they all support standards, that will drive adoption across the service.

## What are the benefits for suppliers of this approach?

On the one hand, this is about supporting start-ups and small and medium sized companies. NHSX, the new unit set up to lead NHS IT, wants to move towards creating technology platforms on which smaller companies can 'plug and play;' but they will only be able to do that if their own products use standards.

We want to give small companies a voice, help them adopt standards and mature them over time, so that we support innovation but also make sure it is replicable. At the same time, we want to make sure large companies have new standards on their development roadmaps.

As a supplier, I know roadmaps are normally defined six to 12 months out, so if there are new standards coming along, we need to know what they are going to be, and when they are going to be released. We also need to make sure that if vendors invest in the development and support of standards those standards are going to be used. If they aren't, as a supplier, you think: "All the resources that I put into



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meeting this standard could have been used for something else; something that would have made a return for me and delivered a benefit for my customers.” There is an opportunity cost in the work we do, and we have to recognise that.

### Why is it important for the healthcare ecosystem to adopt this approach?

The standards that we are working with these days are much more complex than the standards we used in the past. For example, the NHS and its vendors are working with standards for health data exchange called Fast Healthcare Interoperability Resources (FHIR) which are published by the HL7 organisation.

FHIR is sophisticated and it defines how healthcare data should be specified, coded, how it should be secured and implemented when used in different ways (for example as messages, or as documents or as APIs).

This complexity means we do not always know how new standards will work in the wild. So, we need to get them tested, for example in events that we call hackathons. INTEROPen sets these up so developers can spot issues that haven't been thought through in enough detail, or work things out that don't work in the way we expected them to work.

Then, we need to work with organisations like NHSX and NHS Digital to take the learning from the hackathons and test it again with a small number of selected customers, in what we call first of type testing. Once that has been done, we need to work with the whole NHS so we know where the second and third wave deployments are going to be, and everybody can be ready to go.

### What health tech areas are in most urgent need of standardisation in the UK?

We could talk about so many things here. but I would focus on interoperability. As I mentioned above, poor interoperability leads to poor productivity and poor patient experience.

If a patient is being moved from one part of a hospital to another, and data does not move with them electronically, perhaps because different departments are using different systems that don't "talk to each other," then that data will have to travel another way. It may be written down on a form and re-entered or it may just get scribbled down on a sticky note. Even if it is captured formally, re-entering it

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takes time that could be put to better use and it runs the risk that information could be mistyped or misunderstood. Having interoperable IT systems go a long-way towards stopping that happening.

Similarly, when one provider hands over the care of a patient to another provider there is a risk of a gap in care if the receiving provider doesn't have all the information they need. Same when a patient is being cared for by a multi-disciplinary team, and that team can't share information.

That can happen if a patient is being looked after in the community, perhaps by a GP, community nurse, occupational therapist and social care. There will be many people involved and if they are all using different systems and can't share data, then nobody will have a complete view of the patient; which has huge implications for safety.

While setting standards for healthcare IT might sound like quite an abstract thing to be doing, it is absolutely vital. It is standards that support the secure and seamless flow of information across the health and social care system and the care that patients receive.

### What are the blocks on defining and implementing standards?

Standards are not a new idea in healthcare IT, but there have been some big, technical barriers to implementing them. For example, there is huge endpoint variability across health and social care; by which I mean there are big differences in the capability of systems that need to be "talking" to each other.

Some systems have application programming interfaces or APIs, that allow another system to access their features or data quite easily; but some don't and then you have to write SQL against their database to get any information out of them.

That's why making sure that systems and technology platforms come with open APIs is a big focus for NHS IT policy just now. At the same time, if I am honest, the term 'standards' has probably been applied too loosely in the past. A lot of the 'standards' that have been set have just been guides and vendors and organisations have followed them in slightly different ways. In the days before FHIR, for example, there was a standard for sending messages between IT systems called HL7 v2, but there was a lot of variability in the messages that were sent.

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A further challenge is that different localities have different health and care authorities, which means their priorities for interoperability are going to be very different. If you've got one health locality that is focussing on frail elderly patients and another that's focussing on Type 2 Diabetes in the under 50s, they are going to want to exchange different types of information between different health and care staff.

If you have a standard, what is it a standard for? What clinical area? If it's not relevant it's not going to be used. That is why INTEROPen has focused on producing standards for the exchange of information in specific clinical settings; and making sure that all the stakeholders are involved in doing that.

### How will you drive this forward as vendor co-chair at INTEROPen?

We know that NHSX is on board with the standards-based approach. It has said from the outset that interoperability is one of the biggest issues that it wants to tackle, and its chief executive, Matthew Gould, has said the future of health tech is platforms with open APIs that release data to new services, including apps for patients.

This is right in the wheelhouse of what INTEROPen is about, so, over the next 12 months, I want to make sure we are supporting this agenda. I want to move towards a partnership model for INTEROPen, in which vendors would pay to be members. That would give us an income and enable us to run more independently from the NHS. If that happens, INTEROPen would become more like an organisation called Argonaut in the US, which is a private sector initiative that works on information sharing in line with national policy.

I want to do some technical work so the UK can start working with the latest edition of the HL7 FHIR standards. That matters, because the latest edition, FHIR 4, is normative, which means that any future changes that are made to them will be backwards compatible - or that anything that is built using FHIR now will work even if something alters in the future.

I want to speed up the rate at which we define standards and I want fewer standards to be set top-down and more to be defined by the service. If a local health and care record exemplar sets a standard in one of its clinical priorities, for example, I want it to make sure that it does it in a way that means the whole NHS can benefit.

Really, though, I want to speed up adoption. We are getting better at setting standards and we are seeing more standards come through; so for me, this role is all about adoption. ■

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# The Importance of Meaningful Innovation in Healthcare

## Driving Toward the Goals of the Quadruple Aim



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Innovation comes in many forms and for many reasons. It can spur positive change or can extend beyond “change” to “disruption” of an industry. It can be a metamorphosis, or simply an alteration to an existing process. It can be designed to make jobs easier, achieve better results, or increase connectivity. Whatever the reason, innovation yields positive change and forward progress. In healthcare, innovation is focused on saving lives and keeping people healthy, making meaningful innovation paramount.

Healthcare innovation isn’t accidental. A lot of people have to do a lot of work to turn moments of brilliance into something meaningful for customers. Innovation in imaging must be fundamentally and firmly grounded in solving real-world challenges routinely experienced by customers and stakeholders. In order to make innovation meaningful, it must “mean” something to someone; it must make a difference for patients and their families, for the staff that deliver the care, and for the hospital’s overall efficiency, business objectives and economic constraints.

To make healthcare innovation impactful, it should focus on the main points throughout the entire imaging ecosystem. The day-to-day clinical and operational insight of healthcare stakeholders is essential to ensure imaging innovation maps back to what they need to do their jobs better, while also doing so safely, cost-effectively, with less stress and in a more patient-centric way. This could mean reducing inefficiencies, bottlenecks or “wasted time” to streamline radiology workflow at every aspect of the imaging process – from patient referral, registration

and image acquisition, through image coupling with other patient data, to a signed report, physician notification and follow-up of incidental findings. Or, it can be focused on speeding up turnaround time by ensuring that every image provides the data necessary for a more definitive diagnosis the first time. In this way, there is no difference between “imaging innovation” and “meaningful innovation.” They are the same thing.

### Innovation Aligned With Value-Based Care and the Quadruple Aim

As value-based care initiatives are making healthcare providers view everything they do from the eyes of the patient to deliver the most efficient and effective care, innovation in tandem, is often focused on the patient experience. Since diagnosis is often the first outcome in care delivery, it is an area where imaging can make a key contribution toward precision diagnosis for patients and have a high impact in value-based care globally.<sup>1</sup> But, it isn’t the only area where innovation makes a difference. Philips takes an integrated, systems-view approach with imaging innovation that strives toward the four goals of the Quadruple Aim: improving the patient experience, achieving better health outcomes, improving the staff experience, and lowering the cost of care.

Philips’ advanced imaging modalities in CT, molecular imaging, MR and X-ray are focused on seamlessly connecting data, technology and people. We use adaptive intelligence to boost diagnostic confidence, analytics and operational improvement,

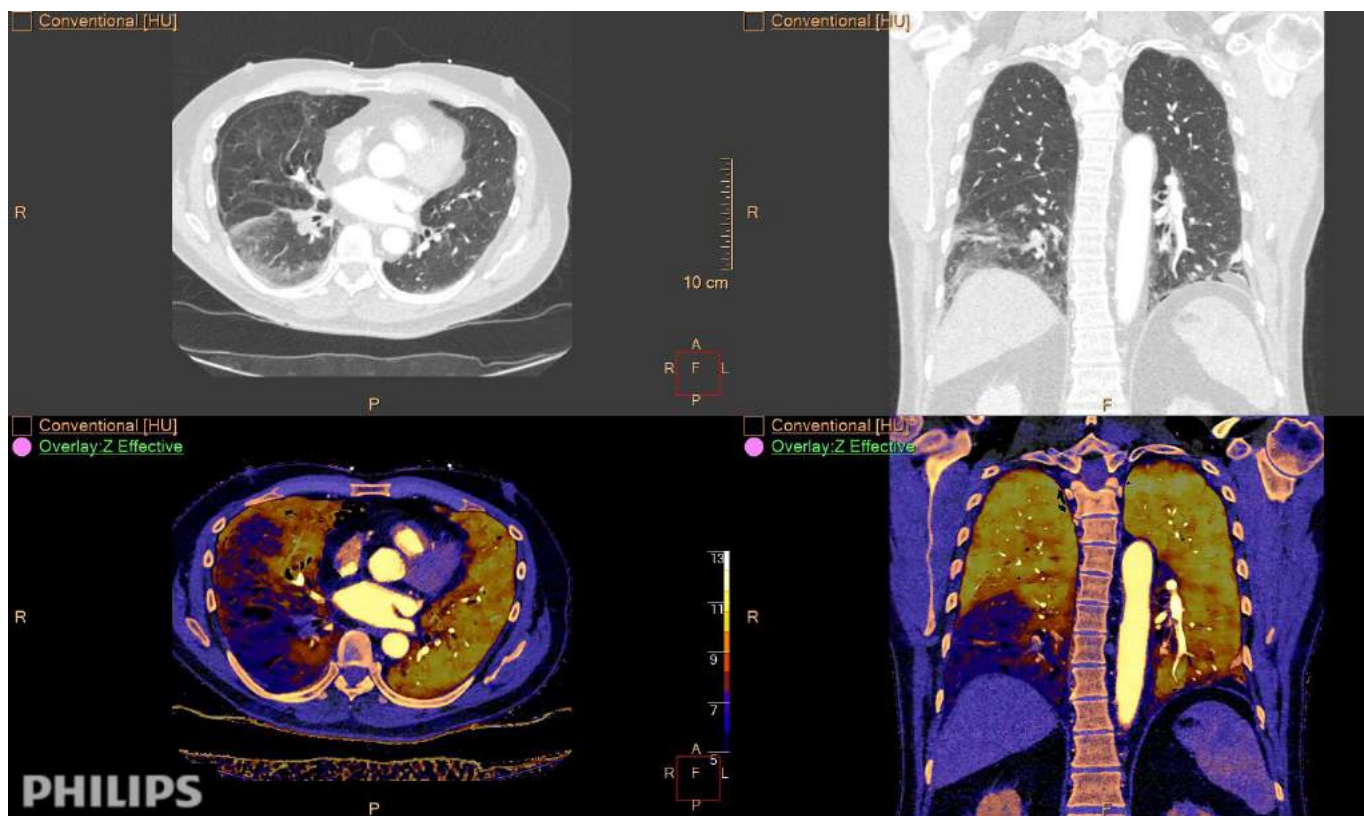
and enterprise partnership models to address the challenges of value-based care and the promise of precision diagnosis. As radiology departments increasingly rely on their imaging solutions to meet mounting demands, integrated technology solutions are critical in these areas to use innovation as a way to move care upstream, keeping communities healthier, and detecting and treating diseases more effectively.

### Innovations in MRI Focus on Speed, Comfort and Confidence

For example, Philips provides high-quality MRI imaging up to 50% faster<sup>2</sup> with Compressed SENSE, a powerful acceleration technique that can be used for the majority of MRI sequences across all anatomies. Compressed SENSE is compatible with multiple generations of Philips MRI systems including our Ingenia MRI portfolio to deliver speed, comfort and confidence, designed to meet today's healthcare provider's needs. To improve the patient experience further, our MRI solutions can be combined with the Philips Ambient Experience In-bore Connect which offers a soothing, immersive and personalized experience for patients. By focusing more on the patient during exams, hospitals can boost the efficiency of MRI procedures.<sup>3</sup>

Many hospitals, such as Hennepin Healthcare in the USA, have seen first-hand the benefits of Compressed SENSE. Neuroradiologist Dr. Mark Oswood, MD, PhD, commented, “We immediately incorporated Compressed SENSE into our protocols,





The always-on design, without increased radiation dose, is an important innovative distinction of IQon Spectral CT over other spectral scanners

and we are seeing overall 20-40% reductions in total scan time for different protocols. So it is being validated in the real world in our experience. And the image quality has been excellent.”<sup>4</sup>

It was the drive toward meaningful innovation that inspired the Philips Ingenua Ambition MRI scanner with its new BlueSeal magnet, a technology which is designed to reduce lengthy and costly disruptions in a MRI practice, and help healthcare facilities transition to more productive<sup>5</sup> and helium-free operations. With BlueSeal, hospitals can

reduce their dependency on helium, an integral part of managing a healthcare organization’s productivity and total cost of ownership. In addition, with the innovative BlueSeal technology, the magnet is around 900 kg lighter<sup>5</sup> than its predecessor and does not need a vent pipe, potentially resulting in easier siting and lower construction costs.

To improve the staff experience, the Ingenua Ambition includes a range of features that combine guided patient setup and Adaptive-Intelligence-driven SmartExam analytics for automated planning, scanning and processing. This frees

up time and allows a single operator to manage the scan with just a single touch of a button.

These types of MRI productivity enhancements from Ingenua Ambition can help make single operator workflow more efficient, which is key to improving the staff experience and lowering the cost of care in line with the goals of the Quadruple Aim.

### Innovations in AMI and CT Provide Clinical, Operational and Business Benefits

Our CT portfolio of solutions helps hospitals unlock insights with certainty, simplicity and reliability. In particular, our IQon Elite Spectral CT technology is redefining the standard of care for patients. As the only detector-based spectral solution, one of the unique key benefits of Philips IQon Elite Spectral CT is that it applies spectral technology 100% of the time, which gives radiologists the ability to see things that aren’t visible with conventional scans that may be significant in determining a patient’s diagnosis. By eliminating the guess-work in image reading with IQon Elite Spectral CT, hospitals can more readily meet one of the key goals of the Quadruple Aim of improving health outcomes for patients.

The always-on design, without increased radiation dose, is an important innovative distinction of IQon Spectral CT over other spectral scanners. At the same time, IQon Spectral CT significantly advances workflows, leading to fast procedures, an enhanced patient experience, and potential cost savings.

In the advanced molecular imaging (AMI) industry, our innovation pioneered the switch to digital with Philips Vereos Digital PET/CT, the first fully digital PET/CT for improved images. Unlike analog PET/CT scanners that use photomultipliers, or analog SiPMs to detect light, the Vereos Digital PET/CT scanner uses proprietary Digital Photon Counting (DPC) technology which converts light directly to a



Philips DigitalDiagnost C90 system offers many innovative efficiency features that help improve workflow, such as the award-winning Eleva Tube Head

digital signal with zero analog noise. With Vereos, healthcare providers are able to make a more confident diagnosis and move toward personalized treatment, which molecular imaging is already helping to inform. These key innovations in AMI are helping provide clinicians with the right level of individualized insight to enable them to understand which patients are responding to treatment, and which aren't – supporting improved health outcomes.

### Innovations in X-ray Offer Intuitive Workflow, Diagnostic Confidence and Economic Value

More than an X-ray machine, the Philips DigitalDiagnost C90 is designed to keep the technologist focused on the patient to improve the patient's overall experience. It offers many innovative efficiency features that help speed up technologist workflow, such as the award-winning Eleva Tube Head and industry's first monitor with live camera collimation, SkyFlow Plus gridless imaging and automated

system movements. The live camera also helps reduce time needed to train new technologists.

The Reiner de Graaf hospital in Delft in the Netherlands has seen first-hand the benefits of some of the innovative features of the DigitalDiagnost C90 system. In using the new Eleva Tube Head for example, one radiographer commented, "Since I have a very short time per patient, speed of the system and comfort for the patients are vital to me. We will be able to give an even more personal treatment to our patients since we have all the relevant information available on the tube head."

To improve health outcomes, the DigitalDiagnost C90's advanced technologies such as UNIQUE 2, Integrated Bone Suppression, and Live Camera collimation improve time-to-diagnosis and department outcomes. Philips UNIQUE 2 delivers the next generation of image processing that detects the appropriate region of interest, automates the contrast, and reduces noise and artifacts to improve visibility of details while the overall impression remains natural. To lower costs, DigitalDiagnost C90 offers the ability to scale equipment to meet individual department, location and financial needs.

### Innovation's End Game

At Philips, we see innovation as a means to an end – improving people's lives. In imaging, our innovation focuses not only on patient care but also on enabling all the healthcare stakeholders including technologists, radiologists, department administrators and C-suite executives, to provide more efficient care.

For patients, it means making it easier to endure an exam by making exam length shorter, the gantry bed more comfortable, the room more inviting and customized, or creating technology solutions that reduce fear and anxiety in imaging, helping the patient feel calmer, informed and more in control. For staff, it means technology that helps

them operate imaging equipment faster and easier, with automated guidance of steps, so that they can focus more time on the patient to deliver patient-centered imaging. For administrators, it means empowering them with the real-time data-driven insights they need to continuously improve operations, patient scheduling and no-shows, and system utilization efficiency. This allows better utilization of healthcare resources and accommodation of patients to receive faster and timelier care. For C-suite leaders, it means tying imaging innovation into their broader business goals, enterprise-level systems and reimbursement metrics or financial and economic realities, to deliver more efficient care at a lower cost and facilitate better access to care to a broader patient population.

It means our innovation efforts tightly align with our customers' objectives and deliver tangible value. That is when innovation means the most. ■



### DISCLAIMERS AND REFERENCES

<sup>1</sup> Frost & Sullivan, Impact of Imaging and Radiology in Value Based Care Paradigm, June 2019

<sup>2</sup> Compared to Philips exams without Compressed SENSE.

<sup>3</sup> SuAzio Consulting, MRI efficiency study, December 2017

<sup>4</sup> Results in case studies are not predictive of results in other cases. Result in other cases may vary.

<sup>5</sup> Compared to the Ingenia 1.5T ZBO magnet.

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# Singapore: Transformative Shifts in Healthcare Management

Summary: In a world of changing healthcare ideals, all that is required is a change in our mindset.



## Dr. Eugene Fidelis Soh

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Transformation is accelerating in healthcare, and this is particularly true with regards to healthcare in Singapore. It has been ranked the longest for life expectancy at birth (Global Burden of Disease Study 2017) as well as second for healthcare efficiency (Bloomberg's Healthcare Efficiency Index 2018). So why change a healthcare system that appears not to be broken?

Challenges such as a fast-ageing population, the rising burden of chronic diseases, emerging infectious diseases and the increasing cost of healthcare can pose a threat to even the most effective healthcare systems. If we are to respond effectively to these challenges, our mindsets need to shift, as well as our perspectives on our healthcare models, workforce and organisational culture.

To keep up, we must keep innovating, and a systems-based approach will be the key to transforming healthcare and sustaining it in a future of changing ideals. To scale and maintain innovation, we must first innovate innovation itself by integrating care redesigns, enabling technologies and job redesigns.

### Case-Study: Smart Hospital of the Future

The development of the future smart hospital in Singapore has been ten years in the making. This has involved a total redesign with a focus on building a system of systems, with an emphasis on autonomy

and decision-making. By using a combination of technologies, Tan Tock Seng Hospital in Singapore has been able to optimise the patient journey and deliver the best care, in real time for every patient.

The Command, Control and Communications or C3 Smart Hospital System has been at the core of the hospital's innovation. Much like the brain of the hospital, the C3 system operates like an airport control tower. It displays bed resources in a patient flow concept from admission to discharge with live locations of every patient. The visualisation of flow has meant patient care can be optimised by giving a coherent picture of what is happening throughout the hospital and highlighting any choke points which need to be addressed. The built-in standard operating procedures of the C3 system also allows responses to be coordinated across departments with closer monitoring.

But what does the future hold for the smart hospital? The next step involves an increased number of sensors to further monitor and coordinate actions. Additionally, the hospital aims to automate decision-making by 80%, leaving the remaining 20% of more complex decisions for staff to address with real-time decision support. The C3 system has been proven to not only benefit hospital operations, and has the ambition to go national by scaling the system across all hospitals in Singapore's Public Healthcare System, and upstream to pre-hospital care and downstream to transitional and community care.

### Redesigning Care

How we manage and integrate health and social care is an increasingly important consideration for any health system. The future hospital is one without walls, where care follows the patient and is responsible for the health of the population it serves. Hospitals will operate in a complex adaptive system. Care will increase in complexity due to an ageing population and rising chronic disease burden. The ultimate aim for Singapore is to shift care beyond the hospital into community, with a focus on health and on what our population and patients value. This will be key for the longer-term sustainability of the healthcare system.

### Managing Complexity in Care

Hospitals often take a linear approach to healthcare, whereas care beyond the hospital extends into a complex adaptive system. New care models will range from value-based ones at the hospitals to relationship-based ones in the community. How we intervene in a complex adaptive system will be vital for us to change the health ecosystem and influence how we care for our patients.

If we are to better manage chronic diseases, changing our mindset and behaviours can be the magic needed to alter our current perspectives. For example, if we compare managing chronic diseases to throwing a bird, no matter how hard you throw it,

the bird will not go in your desired direction. However, if you place a bowl of bird seeds at the target, it will. That is how we should be looking at treating chronic diseases; it is all about changing mindsets from sick care to health care.

## "WE MUST KEEP INNOVATING; A SYSTEMS-BASED APPROACH WILL BE THE KEY TO TRANSFORMING HEALTHCARE AND SUSTAINING IT IN A FUTURE OF CHANGING IDEALS "

### **Integrating Health and Social Care**

Access to healthcare contributes only 10% to what makes us healthy. It is well established that the social determinants of health play an important role in shaping the health of our population. Singapore has done well and was recently ranked first towards the United Nation's Health-related sustainable development goals (The Lancet 2018). However, with an ageing population, new social drivers of health present themselves. These include frailty, social isolation, disability and dementia. These are increasingly the main drivers of healthcare utilisation, longer lengths of stay and readmissions. Our intentions should be helping our seniors to engage in 'active ageing' with the support of community healthcare workers. This is why we need to move to a health and social care model where healthcare becomes an 'activation shop' rather than a repair shop.

### **Enabling Technologies**

In addition to redesigning care, if we are to innovate healthcare systems, we must harness new technologies. To enable healthcare through technologies, it is important to understand that there is a paradox. It is less about the

technologies themselves as it is about the solutions to engineer future care and sustainable business models. We can think of the continuum from smart hospitals to smart homes, and ultimately smart systems to join up care.

We operate with incredibly complex IT systems. Massive technological changes are abounding in healthcare. The traditional IT stack focuses on building on hardware, dataware, middleware and applications. This is slow and less agile, leading to long timelines and high costs.

Singapore has taken an innovative approach and now treats IT as a service with a digital stack for its citizens. This stack builds on information, transactions, life moments and persons. This enables a citizen-centric approach to stacking technologies in a scalable and meaningful way. We can also adopt this approach in healthcare where transactions in our electronic medical records (EMR), can be stacked to patient journeys and then to patients. This will also enable a big data approach to stacking IT for population health beyond the hospital. Ultimately, this is about our relationships with our patients. When we look at a population health cycle, we see the importance of combining health and social data. This is intended to allow early interventions and risk management rather than wait until an emergency occurs.

When facilitating technologies, it is essential to consider the smart hospital of the future and look at it from a holistic perspective. A smart hospital takes on a human persona with a brain, body and functions. Currently, when we talk about smart healthcare, we are generally focused on the devices and tasks. We should, instead, be thinking of a hospital as a smart ecosystem. When we look at the "brain" of the hospital, this can be thought of as our hospital operations or command centre where our staff are supported in caring for patients through system optimisation and analytics. This is empowered by the

body of the hospital which includes the core "backbone" systems like the EMR and administrative systems. Hospital sensors that monitor people, processes, infrastructure are much like the biggest organ of the body – our "skin;" closely monitoring our resources and clinical care. Ultimately, smart applications, devices and robots much like our "limbs" help to deliver the tasks and functions on the ground.

An essential tool for stacking technologies in implementing a smart hospital is technology road-mapping. This can take two approaches. First, mapping the use of technologies to a patient's journey from hospital to home. In this way, we can demonstrate the total value for the patient including health outcomes and cost sustainability. Technology road-mapping also extends the patient journey beyond the hospital. For example, explaining how rehabilitative robots can be used outside of the hospital, in patients' homes; at Tan Tock Seng Hospital, we are developing robots that will follow our patients home and stay with them during their recovery. This completes the value proposition for our patients in their rehabilitation journey back to health.

Another approach is technology and business operations road-mapping, which comprises business planning across strategy, design and technology, during its development. Often technologies are stuck in proof of concepts and never-ending pilots. Having a business operations roadmap ensures alignment, adoption and scalability that is aligned with business objectives.

### **Job Redesign**

Job redesign is to ensure that everyone in the workforce has better jobs and meaningful roles ready for tomorrow's healthcare. Workforce transformation through job redesign is the key to longer term scalability and sustainability in

healthcare. Without this, staff will continue to do the same job rendering any new care model or technology void. Our aims are to redesign jobs to deliver higher value for patients, and to design jobs that our workforce values.

Individual roles are redesigned for future care, while optimising a team-based model of care. Job redesign empowers staff to redesign their work to practice at the top of their licenses.

Tan Tock Seng Hospital has a few ongoing strategies which focus on job redesign and strategies which look at how roles can be added with more value. Staff have access to a handbook on tools to facilitate job redesign and the hospital recently rolled out a micro-learning platform to allow any staff to learn bite-size anywhere anytime on their mobile phones. Staff are encouraged to redesign their roles with more value-adding skills and empowered to go beyond competencies to develop capabilities to learn, unlearn and relearn. These capabilities include tools for improvement, innovation and engagement. Nursing which makes up the majority of the workforce in healthcare is redesigning jobs where nurses go beyond nursing and nursing goes beyond nurses. In moving care to the community, traditional multi-disciplinary care is not sustainable; instead care has to be delivered in inter-professional teams and delivered by staff that are transdisciplinary in their training. This makes care sustainable and relationship-based.

It is important to engage staff on what staff value in their jobs in order to understand the 'stay and strive' factors for our workforce. There are three factors that are universal in healthcare: meaningful work, meaningful relationships, and opportunities to learn and grow. We must bring teams together and let them design their care and jobs for the future.

Many hospitals are focused on organisational excellence. It is imperative that if we are to achieve excellence, we need to also focus on the deeper learning cycle of our organisations that promotes organisational health. The health of our organisation enables our capacity for change. It focuses on our people and what is of value to them, whereas organisational excellence focuses on the systems and the value we deliver for our patients. Organisational health enables a workforce culture that embraces innovation and is future-ready.

The first ingredient for shifting our workforce culture in an organisation is relationships. This is not just about role-modelling as in traditional clinical leadership models, but developing collective leadership more than leaders, and leadership at all levels of our organisation. It is about engagement, teaming and networking to build relationships and trust in our people and partners.

Another ingredient is about shifting learning from traditional courses to social learning, where learning is in communities of practice and across domains and departments. The last ingredient is renewal. This gives our people the capabilities and tools to do our jobs well, better and differently in order to address future needs.

The key to building a hospital for the future is to create one without walls, in the sense that innovation should be driven by relationships, co-learning and renewal. After all, it is the better people that deliver the better care and build a better community. ■

## KEY POINTS



- The Singapore healthcare system ranks highly in the world for its healthcare quality and efficiency.
- The smart hospital of the future is at the core of its healthcare innovation and its redesign as a hospital without walls.
- The healthcare ecosystem is not linear but extends to care relationships in the community.
- When introducing new technologies, it is important to take a systems approach to innovation that integrate both care redesign and job redesign.
- An innovative culture rests on the health of the organisation and its capacity for change through building relationships, co-learning and developing renewal capabilities.



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20 Nov 2019



EUROPEAN ASSOCIATION  
OF HOSPITAL MANAGERS

# Management Workshop

EAHM European Day at the Deutschen Krankenhausstag

9.00 – 9.15

**Registration**

9.15 – 9.25

**Welcome / Introduction**

**Philippe Blua**, *EAHM President, France*

**Chair / Moderation**

**Marc Hastert**, *EAHM General Secretary, Luxembourg*

9.30 – 9.45

**The consequences of Brexit for Irish and European Hospitals**

**Gerard O'Dwyer**, *Chief Executive Officer South / Southwest Hospital Group, Ireland*

9.50 – 10.05

**Healthcare in Luxembourg:** Highlights in Hospital Management

**Sylvain Vitali**, *Deputy Secretary General Luxembourg Hospital Federation (FHL)*

10.10 – 10.25

**Healthcare in Poland:** Highlights in Hospital Management – Focus on the Digitization of Polish Hospitals

**Prof. Dr Mieczyslaw Pasowicz**, *EAHM Vice-President, President of the Polish Association of Hospital Directors*

10.30 - 11.10

**Patient Safety First – Procedures and Medical Devices**

**Dr. Ing. Peter Gausmann**, *Managing Director of GRB Gesellschaft für Risik-Beratung mbH;*  
**Dr. Gabriela Soskutý**, *B. Braun Melsungen AG*

11.10 - 11.40

**Break**

11.40 - 11.55

**Healthcare in Portugal:** Highlights in Hospital Management

**Alexandre Lourenço**, *President of the Portuguese Association of Hospital Managers*

12.00 - 12.15

**Healthcare in Sweden:** The Challenges in Hospital Care

**Erik Svanfeldt**, *International Coordinator Health and Social Care Division Swedish Association of Local Authorities and Regions*

12.20 - 12.35

**Healthcare in Switzerland:** Highlights in Hospital Management:

**Rolf Gilgen lic. iur. Rolf Gilgen**, *CEO Spital Bülach AG, Switzerland*

12.40 - 13.00

**Discussion and Conclusions**

**Philippe Blua**, *EAHM President, France*

# Advancing Health Through Science and Technology Innovation



**Paul Stoffels**  
 Vice-Chairman of the  
 Executive Committee  
 Chief Scientific Officer  
 Johnson & Johnson

Over the past century, thanks in large part to advances in science, technology and medicine, the average human life expectancy has more than doubled. The pharmaceutical industry has played an important role in these advances by translating basic scientific insights into tangible solutions, and thus has delivered significant value to society in the form of years of life and quality of life.

If you look at the data over the last several decades, it demonstrates a significant increase in longevity and life expectancy. For example, the rate of cancer death has been decreasing, and people are living longer with cancer than ever before. Approximately 64% of US patients diagnosed with cancer in 2005 have lived 10 years or more beyond diagnosis, up from 35% for those diagnosed in 1975. This progress is due to significant investment in cancer research and the introduction of new solutions like immunotherapy, cell therapy and precision medicine. Another example is HIV. In the early 1980's, if a patient contracted the HI V virus, he or she had just a few years to live with very poor quality of life. Today, with treatment, HI V positive individuals have a near-normal life expectancy. Yet another example is surgery, where doctors can employ robotics and advanced digital surgery solutions to deliver significantly better outcomes for patients undergoing many types of procedures.

Despite this progress, many complex healthcare challenges remain. Alzheimer's Disease, cancer, diabetes and depression are chronic diseases that pose challenges in all regions of the world and drive tremendous cost in the healthcare system. But with the explosion of new science and technology advances at our fingertips, I have never been more optimistic about our ability to tackle the complex challenges facing the world today.

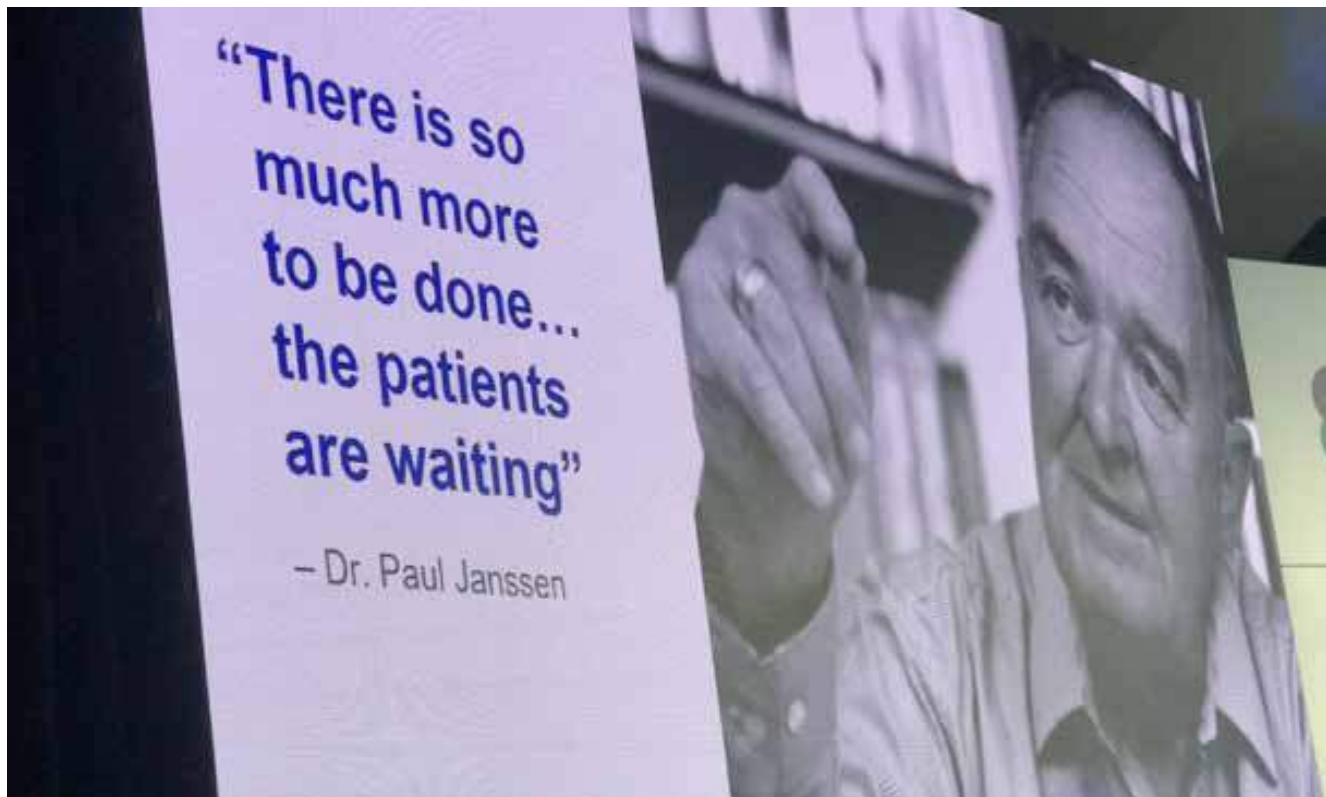
In the past several decades, due to the investment by government and industry, the scientific community has sequenced the human genome, delivered personalized medicines, learned how to edit DNA, and developed capabilities to print replacement body parts using 3-D printing. We are learning more about the microbiome and the power of harnessing the immune system to tackle cancer. Robotics, machine learning, artificial intelligence and digitalization are providing game changing opportunities. The explosion of data gives us opportunity for unprecedented insights, and the potential to transform healthcare is enormous.

In the coming decade, we could see some of the most exciting and impactful healthcare breakthroughs of all time. However, no one organization can overcome these complex obstacles alone. To solve today's challenges, and reap the

promise of today's science and technology innovation, it will require extreme collaboration on an international scale. As a scientific and medical community, we have gotten much better at collaboration between academic institutions, government research institutions, hospitals, biotech start-ups and pharmaceutical companies, leveraging ideas, capabilities and resources to accelerate innovation, solve problems and achieve positive outcomes for society.

In addition to advancing new treatments and solutions, we are working to intercept and prevent disease from ever happening. For most chronic disorders, the disease process often starts decades before it presents symptomatically. This is true with diabetes and metabolic disease, cardiovascular disease, dementia and mental health, as well as cancer. Being able to identify individuals at the earliest stage of their disease can completely change the therapeutic paradigm for these disorders, and also transform the way that healthcare is delivered. Such early diagnostics form one of the most important contributors towards the goal of moving towards a healthcare system that is more focused on sustaining health, rather than treating late-stage patients with symptomatic disease. For infectious diseases, the means of developing new preventive vaccines. One example of significant progress is an HIV vaccine:





after decades of research, we finally have a promising candidate in clinical trials. If successful, it will be a major leap forward in making HIV a disease of the past.

Johnson & Johnson is committed to harnessing our talent, resources and expertise, as well as working in collaboration with a broad set of partners around the world to turn the promise of innovation into reality. For more than 130 years, Johnson & Johnson has been harnessing

science and technology to enhance and advance the health of people around the world. The company was founded on the insights of antiseptic advocate Joseph Lister in 1885 when the Johnson Brothers created a line of ready-to-use surgical dressings. Today, Johnson & Johnson is one of the largest and most broadly-based healthcare companies in the world, delivering innovative solutions in pharmaceuticals, medical devices and consumer products.

At the same time, we know a great idea can come from anywhere. We seek the best science, wherever it may be. Innovation today is occurring at a much faster rate than we could have ever imagined even ten years ago, and there are many technological and medical advances taking place outside our company, so it's critical that we are connected with the external environment. We work to fuel the life sciences ecosystem and foster early-stage innovation so that great ideas from anywhere in the world can become breakthrough products for patients. And we also work to ensure that everyone, everywhere has access to these solutions. Through our global public health organization, we collaborate with governments, NGOs and others to ensure our innovations reach people who need them everywhere in the world.

Every day, we are fueled by our vision to make a profound impact on human health through science and innovation. We are committed to identifying and advancing the most promising ideas, and working in collaboration across the globe to deliver value to society measured in years of life and quality of life for people all over the globe.



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# Innovation and Inspiration for Healthcare

Summary: The EAHM Innovation Award 2019 honoured posters for four healthcare projects that are challenging the status quo and innovating in logistics, healing and tech leverage around Europe. Read on for the run down on the winning initiatives.

## Logistics, Innovation and Technology

The challenge for the EOC group was multi-faceted; operating two hospitals with a total of 320 beds in the city of Lugano, transporting blood from facility to facility was proving inefficient and uneconomical.

The smaller hospital had a small blood-testing lab, but it didn't operate 24/7 so blood samples from patients in the emergency were being transported to the main hospital's blood-testing laboratory, which runs round the clock.

Taxis handled the blood transport and the problems were evident: they were time-consuming, cost intensive, inefficient and not environmentally friendly. Taxi availability wasn't always guaranteed and transport time meant a loss in all round treatment quality. The EOC Group partnered with Swiss Post to address the inefficiency; the drone transport project was born.

The drone flies entirely autonomously from the smaller Hospital Italiano to Hospital Civico at a speed about 70km/h and with a payload capacity of 2kg. According to the abstract, "landing stations for take-off and landing have been installed at both hospitals. The flight route has been carefully chosen to minimise the risk of damage in case of an emergency landing."

Logistically, the drone blood transport works much better than taxi in terms of both availability and if the weather is too poor for a drone flight, the facilities can revert to taxi transport. Significantly, the drone journey

time is cut by up to 70% with the flight time taking about five minutes. Process costs have been lowered by up to 80%, and the prices for transportation are already marginally lower than the costs for a taxi.

The environmental impact deserves a mention. While a taxi journey involves shifting around 1.5 tonnes between hospitals for every 1kg of blood samples, a drone weighs around 10 kg and can carry the same load.

In the coming years the Swiss Post plans to implement this solution with other hospital groups in Switzerland.

### First Place: Drones in Action for Public Health

**Innovators:** Luca Jelmoni (CEO Ospedale Regionale di Lugano) and Andrea Marrazzo (Swiss Post)

**Facility:** Ente Ospedaliero Cantonale (EOC)

**Location:** Lugano, Switzerland

## Healing Architecture

The grounds of the LVR-Klinik Langenfeld cover about 42 hectares. As opposed to one central hospital building, approximately 50 facility buildings spread out over the area. The clinic has extensive green areas, small forests, footpaths and areas to relax. These outdoor areas have the two-pronged aim of supporting the healing of patients and meeting the clinic's ecological and environmental goals.

Since 2017, LVR-Klinik Langenfeld has worked closely with the local Nature and Biodiversity Conservation Union (NABU). The clinic's premises encompass a large protected biotope for local bird breeds, insects, bats and other animals. More than 30 bird breeds live within the grounds which the clinic has used to its advantage; one of the biggest interventions in cooperation with NABU, also included in therapy plans, is the bird protection project. In the work-therapy group "wood," patients and therapists build bird boxes using environmentally-friendly materials and distribute them all over the clinic's premises.

The bird-shelter and feeding initiative is only one example in the extensive outdoor work of the clinic. Groups plant local flowers and fruit trees not only in the green areas but also in the clinic's organic garden where vegetables and herbs are cultivated. Patients have the opportunity to learn about the full process of gardening and selling the produce they grow. Activities are carried out in the presence of a therapist as part of a therapy programme to help promote physical, mental and social skills.

Additionally, all new buildings have been constructed in the passive-house-standard. This model of building is very energy efficient requiring minimal levels of power to achieve a comfortable temperature year round.

The NABU-project and the passive-house-standard buildings are supporting the clinic in achieving its

ecological goals.

## **Second Place: Environmentally-Friendly and Ecological Healing Environment and Architecture**

**Innovator:** Holger Höhmann

**Facility:** LVR-Klinik Langenfeld

**Location:** Langenfeld, Germany

## **Big Data and Digital Health – Innovation and Technology**

AZ Maria Middelaes is a private, non-profit 542-bed acute care hospital in Belgium.

In spite of the financial burden for the hospital in the current Belgian fee-for-service healthcare model, the team put a hospital-wide assessment and monitoring process for vital parameters into place resulting in an 80% drop in the number of resuscitations across the facility. New health technology and data analysis and reporting into actionable clinical dashboards with automated alerting enabled this development along with an open no-fault culture on the floor, empowerment and, critically, supportive leadership.

The abstract described the process: “Based on the measurement and registration of five physiological parameters – blood pressure, heart frequency, respiration rate, body temperature and saturation – the level of consciousness an Early Warning Score (EWS) is established three times a day for all admitted patients. When the EWS score goes up, so does the frequency of measurements. The frequency can be as high as every 30 minutes. On a yearly basis the hospital collects more than 2.5 million data points.”

Such close monitoring allows identification of patients whose condition is evolving into critical illness up to eight hours in advance giving the medical team time to investigate and discuss treatment options amongst the caregivers and

with relatives.

Uniquely positioned in Belgium in its application of EWS monitoring, AZ Maria Middelaes is raising the bar for qualitative and safe healthcare.

## **Joint Third Place: Reduction of Resuscitations and Vital Sign Data Collection Technology**

**Innovators:** Christophe Mouton, Dr Ronny Goethals, Dr Diederik Van Sassenbroeck, Dr Henk Vanoverschelde, Tom Verbeke, Kurt Roesbeke, Jolien Vanden Berghe, Kathleen Stam

**Facility:** AZ Maria Middelaes

**Location:** Ghent, Belgium

## **Impact of Vital Sign Data Collection Technology on Data Quality and Patient Experience**

In line with its EWS monitoring initiative, AZ Maria Middelaes is introducing automated vital sign monitoring equipment and a new wearable sensor for data collection that is transferred automatically into the electronic medical record.

First steps included installation of spot check monitors and respiration pods. In a second phase a continual monitoring “hotspot package” for patients with a second EWS assessment of three or higher was introduced. The equipment for this monitoring comprised a wearable biosensor, a peripheral oxygen saturation meter and non-invasive blood pressure monitor.

Data analysis improved multi-fold; the growing database of clinical parameters displayed increasingly precise and reliable data compared to a manual process.

Notably, accuracy improvements have been recorded in the respiration rate measurement with the odds of initiating an alarm being 2.1 times higher compared to the manual



measurements. For consciousness level, heart frequency and oxygen saturation no differences between the two methods were demonstrated.

This integration of technology into monitoring processes has improved the general patient experience as nursing staff have more freedom to focus on core care duties. Additionally, the use of wearables means patients can be monitored from the comfort of their homes avoiding unnecessary hospital admissions and cutting length of hospital stays.

## **Joint Third Place: Impact of Vital Sign Data Collection Technology on Data Quality and Patient Experience**

**Innovators:** Christophe Mouton, Dr Ronny Goethals, Dr Diederik Van Sassenbroeck, Dr Henk Vanoverschelde, Nicky Van Der Vekens, Tom Verbeke, Kurt Roesbeke, Jolien Vanden Berghe, Kathleen Stam

**Facility:** AZ Maria Middelaes

**Location:** Ghent, Belgium



**Douglas Franco**

SPI Marketing &  
Business Dev. Lead  
Johnson & Johnson  
Medical Devices EMEA

# Innovative Technologies for Improved Healthcare

Innovation is at the heart of everything we do at Johnson & Johnson Medical Devices. But while we believe in striving forward with successful technologies, at the same time, we recognise the need to look at existing processes first and identifying how hospitals can synchronise and standardise these processes. The goal is optimisation so that we can generate high-quality, consistent data, and help hospitals transition efficiently when implementing new technologies.

At Johnson & Johnson, we use a partnership model where we sit down with everyone involved – the hospital management and the care teams – and understand the problem. Only if we understand the real challenge can we come up with effective solutions. The key is to tailor these solutions for each hospital, and use KPIs as indicators to measure success once these solutions are implemented.

Over the years, we have built technologies that can make the healthcare system more streamlined based on the problems/challenges that hospitals face. For example, how can we better connect healthcare professionals and patients? How can we make the operating room more efficient? How can we improve the hospital supply and logistics system? How can we help hospitals finance products of innovation? And finally, and most importantly, how can we make the OR a safer

place? Often, we help care teams in their daily routine to improve quality and efficiency.

We want to address the bigger issues – that is our triple aim vision. Not only do we want to make hospitals more resource and cost efficient, and improve patient outcomes and experiences, but we also want to make the lives of caregivers easy and simple. We don't want to just generate data for the sake of it, but we want to create insights from this data. We want to make it more meaningful;

"JOHNSON & JOHNSON'S  
VALUE-BASED HEALTHCARE  
APPROACH, CAREADVANTAGE,  
INCLUDES A SUITE OF HOSPITAL  
SOLUTIONS AND SERVICES."

we want to identify patterns and trends so that we can identify areas of improvement. And while doing all these things, we want hospitals to not get bogged down with new technology but to integrate it smoothly within their existing hospital network and IT infrastructure. We believe that everything we develop should be scalable, supportable and deployable on a large scale.

Johnson & Johnson's value-based healthcare approach, CareAdvantage, includes a suite of

hospital solutions and services. Here I'll focus on just three of our technologies that are making a difference: Care4Today, Surgical Process Institute (SPI) and C-SATS.

## Care4Today

Care4today is a tool designed to help healthcare professionals and patients remain connected. It can help create a better communication between the multidisciplinary team, the hospital, and the patients. Physicians can see patient status and stay up-to-date on all important elements. At the same time, patients can contact their care team through their smartphone app. They can see who is on the multidisciplinary team and can engage better with them. They can also see their progress/updates and schedule appointments. With the Care4Today platform, the hospital does not require heavy investment or major changes in their IT system. It is simply a matter of using the PC and app-based technology, and encourage patients to do the same.

## SPI

SPI is a leading specialist for the standardisation and digitalisation of surgical workflows. It offers digital surgery solutions that enable surgeons to choreograph their OR guiding the entire care



team seamlessly through every surgery. Surgical teams have access to an intuitive and modular platform allowing them to digitally design and implement their own surgical workflows, synchronised across different profession groups. These structured surgical workflows also support training and onboarding of new team members and surgical performance can be assessed and benchmarked, providing valuable insights. In addition, SPI's solution creates a customised, digital operative report automatically that records all steps of the surgical procedure. By supporting care teams to operate in a more synchronised way, SPI represents a first step towards

smarter surgery, transforming the surgical experience to help our customers around the world deliver consistent, high quality care and efficiency in their OR.

### C-SATS

C-SATS (Crowd-sourced Assessment of Technical Skills) is a technologically advanced, accurate and objective assessment system that is designed to help healthcare professionals improve their skills. The key areas where C-SATS can be effectively used to improve outcomes include surgery, pathology, nursing, device usage,

homecare, and simulation. The C-SATS technology is very easy to implement. There is a small tablet device that has to be placed in the operating room. The C-SYNC can connect directly with the hospital's existing media devices. C-SYNC records the surgery, after which the clinician can transfer the video which will be evaluated and analysed by experts. The doctor will receive feedback from these experts in the form of a report that will include a graph with domain scores and learning opportunities. C-SATS uses validation assessment tools such as GEARS and GOALS to measure clinical skill and potential.

C-SATS technology offers several benefits:

- Speed and reliability as it is a tool that can provide accurate results.
- Convenience because reviewers are available 24/7.
- Affordability as it can help save the cost for peer review.
- Accuracy as it provides accurate performance scores;
- Objectivity as it is completely unbiased and only gives statically-valid results that are based on multiple reviewers' feedback from across the world.
- Quantifiable results based on validated tools.

With a 'Solving Starts with Listening' approach, Johnson & Johnson introduces these and other CareAdvantage services and solutions by a process of needs identification and co-creation to achieve the desired results.

Find out more here: <https://www.jnjmedicaldevices.com/en-EMEA/service/care-advantage>.

# Improving Patient Experience in the Era Of Digitisation

An overview of Affidea’s journey embedding digital tools across its network to orchestrate patient care and improve patient experience.



**Zisis Sotiriou**  
SVP Operational Excellence  
Affidea Group

It was the airline industry which proved 60 years ago that through digitisation, airports could become more efficient and safer. Airports introduced the air traffic control technology which allowed them to swiftly transition from scheduling few hundreds of flights a day to managing millions of passengers every day. Thus, digitisation and automation have made them more efficient and safer for their customers.

Healthcare is now transforming to a more data-driven industry, where data can be used to continuously improve our daily operations, enhancing patient safety and delivering faster, better and more efficient care every step of the patient’s pathway.

The possibilities for digitising healthcare are endless – from access to throughput to quality care across the patient pathway.

At Affidea, we see 7 million patients every year, and every one of them is equally important to us. We understand their expectations about accessible, high-quality medical care and that’s why, we want to make sure they have the best possible care, delivered quickly, effectively and safely.

With the use of digital tools, we are monitoring the patient pathway from the first contact inside our centres. We have introduced KPI dashboards

which are meant to offer our teams better insight around our operations, resulting in constant actions of quality improvement and overall improved patient experience.

## Patient Experience Starts From the First Contact

We understand that the first contact with our centres is often the most important. We are establishing national call-centres across our network to ensure there is always an Affidea caregiver to answer any patient questions and help them with information when they need it most. We have managed to reduce lost calls from 40% to less than 5% in the countries where we operate national call-centres. This directly translates into increased access for our patients and higher patient satisfaction.

We have also started to digitise our patient consent forms which ensure the protection of our patient data and the strictest compliance to privacy regulations, while allowing our patients to manage their consent anytime, anywhere, in a secure, GDPR compliant way. This gives them convenience, and less time spent with paperwork in the centre, and allows them to go home faster.

## Diagnostic Imaging Services With the Patient in the Centre of Everything We Do

Together with our clinical teams across the countries, we ensure that the examination is delivered at the highest quality in the shortest possible time. We connected our MRI scanners through a cross-border digital platform giving access to unified protocols and allowing us to monitor image quality as well as scan time and idle time. Continuously improving the way we do things, we kicked off a project in 24 clinics, providing better access for patients to MRI examinations, increasing by 14% the number of exams performed every month.

Reducing unnecessary procedures from the patient pathway, and eliminating waiting time is our focus when improving the patient experience. Data is analysed at different stages of the patient pathway inside our centres. However, the typical patient won’t even realise that these digital tools even exist, but they will experience less waiting time and faster and better care.

The potential to make a positive impact on patient and doctor experience is truly tremendous. This is the beginning of Affidea’s journey embedding digital tools across our network as a new way of orchestrating patient care and improving patient experience because we believe that nothing is more important than health. ■

# Innovative Healthcare Strategies

Summary: The 28th Congress of the European Association for Hospital Managers took place on 11 - 14 September 2019, where themes combined innovation and healthcare strategies, focusing on what this means for hospital management. Speaking during the Official Inauguration, Pedro Facon gave insights into what he thinks innovative healthcare means to the healthcare industry.



**Pedro Facon**

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 @PedroFacon

The congress is all about the strategy for the future. But let us go back in time and visit the Hostal dos Reis Católicos, a Hospital founded at the end of the 15th century in Santiago de Compostela. This was an innovative hostel for the pilgrims who were ahead of the times in many ways, and they experienced some interesting challenges we also face today:

## Challenges and Innovation

- **Architecture:** The building was innovative in its design, shaped like a cross so, therefore, posed many logistical problems.
- **Governance and Management:** A sole manager was designated to govern the hospital, independent from clerical or political powers. He had a lot of authority with his own constitution and even with its own hospital jail at his disposal. Maybe some managers today are secretly dreaming of this kind of authority.
- **Financing:** The hospital was financed through multiple sources, from the state, over contributions from local farmers and contributions from Granada that had been conquered by Castilia. This complexity and permanent search for new financing sources is a massive topic for modern hospitals globally.

- The hospital was very active in educating its staff and worked with its own medical school.
- They started to develop protocols and norms such as how many nurses needed to be around a bed, how many patients can be in a bed, how often sheets needed to be changed and cleaned, and how much and what nurturing a patient required, etc.
- New roles like administrators, lawyers and accountants were invented in this hostel.

Why am I talking about the past? The fact is hospitals have always faced challenges. Over the last 500 years, a lot of things have changed for the better, but we are still confronted today with a lot of similar problems healthcare professionals faced back then. Ultimately, the type of challenge is not that different.

Today, it is, once again, about redefining the concept and establishing what we are as a hospital. How can we better relate to our patients, other hospitals and other actors in the healthcare, care and wellbeing system? These are some of the key strategies of primary importance that we must develop both in Belgium and globally. It's not only about redefining the concept, but also redefining business processes, taking into account digital and technological advances, in care and in administration

and finance. Additionally, it is about re-dynamising governance of the hospitals, partnerships and other facilitators associated with the institutes. There is one main question for hospitals: "How will you differentiate yourself?" This question is valid for the hospital sector as a whole in relation to other actors in the healthcare system. But it's also valid for each hospital individually.

Speaking as a representative of "the regulators," I want to stress that we are well aware of all these challenges the hospital sector is facing; moreover, these are the same challenges we are facing as a public administration organisation. Indeed, I am not only a regulator for a series of actors, I am also a manager of 300 people. We all have the same challenges, therefore, we can all learn how to address these problems together by creating partnerships and platforms for exchange of knowledge and learning experiences.

I have no doubt at all that the hospital sector will indeed reinvent itself. It will take some time, but I believe that it will happen.

During EAHM 2019, Dr. Paul Stoffels of Johnson and Johnson and Prof. Fidelis Soh, CEO of Tan Tock Seng Hospital put forward some very

Continues at p. 418

# Brexit: Wreaking Havoc in Healthcare?

The date is set (we think!) - on October 31st the United Kingdom is to leave the European Union (EU). Since the 2016 referendum on membership of the EU bloc, when 51.9% of British voters opted for an exit from the European Union, the Brexit negotiations have been erratic and dramatic with no resolution about the form the exit will take. Trade deals, immigration and the impact on the UK and bloc-wide economy have dominated the agenda since the vote but what about the effect Brexit will have on the UK National Health Service (NHS), patient rights and medical research? Healthcare experts from across a spectrum of disciplines gave HealthManagement.org their views.



## Mark Dayan

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of the EU medicine regulation system eventually, and reciprocal healthcare too. But the impact would at least be padded by a transition period and better wider terms of trade. A competent government should be able to negotiate continued access to science programmes, and aligned regulation for medical devices.

A “soft” Brexit where the UK stayed in the Single Market would mean very little change from what we have now. But the UK would lose its voice in the institutions that make the rules, potentially leading to science and medicine regulations that would suit the country less in the future.

It’s impossible to predict what Brexit will mean for the NHS since how or even if it will happen remains undecided. But, if we look separately at each possible path out of the EU, the picture is clearer.

A no-deal Brexit would be a real shock to the healthcare system. The aligned laws that support access to medicines, devices, and science cooperation programmes would vanish, causing friction and disruption. We would lose European Health Insurance Cards (EHIC) and other reciprocal healthcare schemes. And under new controls on migration from the EEA as laid out by the last government, a slump in the numbers coming in would worsen the staffing crisis. A Brexit with a deal but which involved leaving the Single Market would still mean being shut out



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EU citizens currently enjoy certain rights under EU law concerning health treatment abroad, both in planned and unplanned situations. While it is true that EU Member States are, in principle, responsible “for the definition of their health policy and for the organisation and delivery of health services and medical care.” EU law has a huge impact on various stakeholders and in various ways. Depending on the type of Brexit (soft, hard, or no agreement), this will have huge consequences on EU27 citizens and UK citizens, seeking healthcare in either direction. Hence, we don’t have a “bright future,” but a dismantling of existing rights.

While the Withdrawal Agreement does not mention EU rules on patients’ rights detailed under the relevant EU Directive, it provides for some complex rules for the coordination of social security systems.

However, if the Withdrawal Agreement is rejected by the UK, the EU27, or the European Parliament, such a no-deal will have consequences in both directions; for cross-border healthcare at the island of Ireland, for British pensioners in the EU, to name but a few examples of direct effects. This doesn’t event touch on indirect effects with regard to EU rules on public health and research.





## Michael Johnson Ellis

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There are a number of current potential threats to the NHS that could be exacerbated by Brexit. For example, the current recruitment and retention crisis will potentially provide a huge challenge to the sector. In fact, Brexit has already had an effect in the UK, with applications from EU nurses down 96% since the 2016 vote.

To mitigate this, decision-makers need to ensure they are reducing spend on temporary staff and directing their focus to securing permanent workers. With the huge amount of money that can be saved from cutting spiralling agency costs, Trusts can then create more favourable workplace conditions, reducing the likelihood of a staffing exodus. In addition to this, with a concerted effort at creating strategic workforce plans aimed at pipelining future talent, Trusts can prepare as best as possible for future externalities.

While Brexit will undoubtedly pose a large test, it's important to not pay too much attention to fear mongering. Despite what many may say, there will be more than enough high-quality talent available to staff the NHS post Brexit – but only if workforces are managed efficiently.



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With Brexit, the first concern I have is about the patients. We must not forget there are many people from continental Europe living in the United Kingdom. There are many people from the United Kingdom living in continental Europe. These people have well-established lives, either in the UK or in Europe spanning many years. As they are human, they will eventually face health problems. At the moment we have no clarity as to how these people are going to be treated.

When you are a doctor, politics is one element of it- but your main care is about the patient. In this situation, we have no clarity whatsoever of what type of care we will be able to offer our patients and this is a major issue and my biggest concern.

Parallel to this falls the issue about health professionals, because there are many professionals who have moved to both sides of the English Channel. Again, they have well-established professional lives and they don't know what the status of their employment, the status of progression, or the status of their family

in the years ahead will be. So, again, this lack of clarity is detrimental for the practice of those people, not only for radiology but also for all specialities.



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charges (if any) are to apply.

This health-card scheme, then, is a powerful factor facilitating free movement among the participating states. The impact of Brexit is highly uncertain in many areas, especially if it takes a 'hard' form. There is no uncertainty, however, about its effects on the British when it comes to their access to healthcare during visits abroad. In the absence of a formal agreement stating otherwise, namely, they will no longer be able to use the EHIC. Instead, they will need to return home to receive the care they require, or they will have pay for it up front. Nor, unfortunately, will residents of the participating countries be able to use the EHIC when visiting the UK. Should a hard Brexit take place, this will be the harsh reality.



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Although health is primarily a national issue, decades of European integration mean that Brexit would have wide-ranging impacts on the NHS. Obvious examples include the free movement of the healthcare workforce, access to medicines and medical devices licensed through European mechanisms, and reciprocal healthcare arrangements. Less obvious examples include cross-border European Reference Networks for rare diseases, EU investment in NHS infrastructure, and integration in Europe-wide health research.

The effects of Brexit on healthcare could thus be widespread and overwhelmingly negative. The precise effects depend on the type of Brexit – the harder the Brexit, the worse the effects, with no deal being the worst of all.

The Withdrawal Agreement at least provides continuity while the long-term future relationship is negotiated. The Northern Ireland backstop has varying effects, with continuity in some areas, such as health products, but no continuity in others. The Political Declaration on the Future Relationship envisages a relationship that is centred around a free-trade agreement, in which wider health-related issues are largely absent. In the long run, though, the largest impact on the health system is likely to come from Brexit's impact on the wider economy, and thus on the ability of the UK to finance the NHS.

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Director for Health Systems  
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Ministry of Health  
Sultanate of Oman

# Leading Change as a Physician

Summary: Erin Sullivan introduces Xavier Corbella, physician turned CEO, to discuss his leadership journey and implementing change within the health system.



## Xavier Corbella

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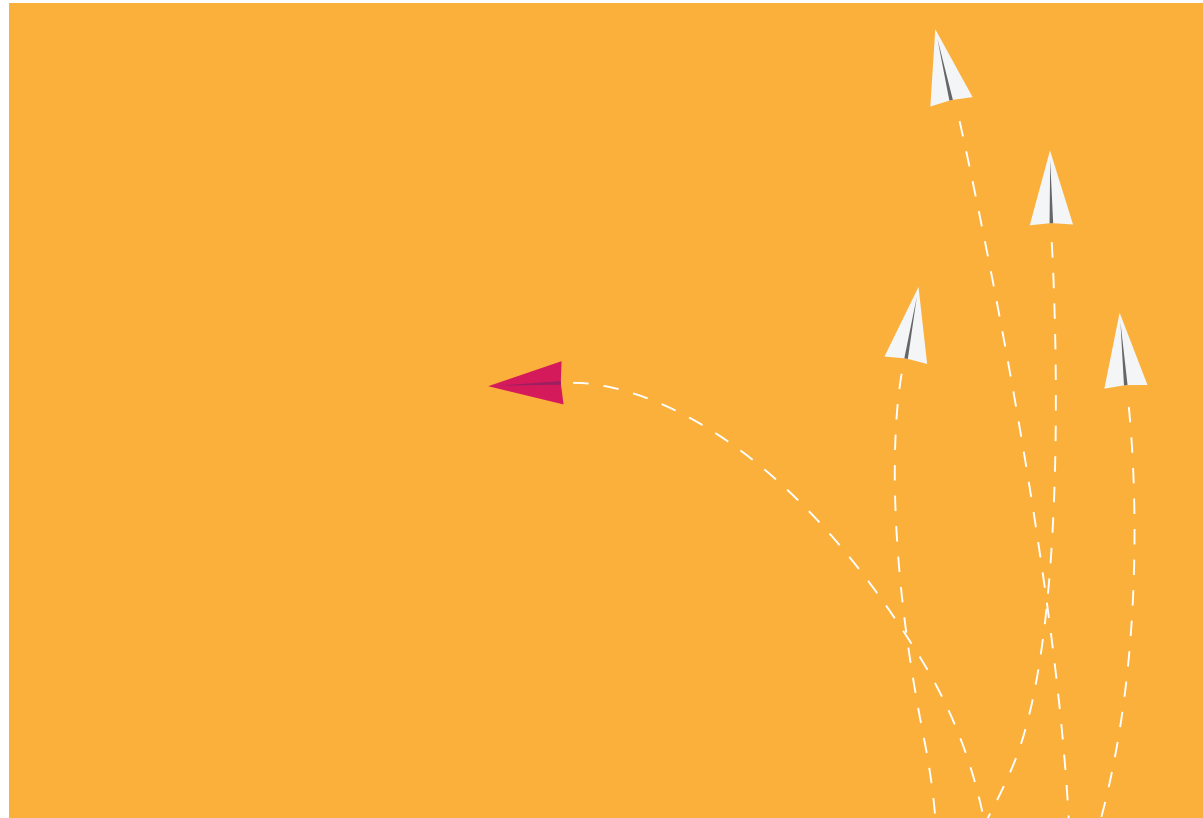
## Erin E. Sullivan

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show,' I typically teach the case and participants focus on analysing Dr. Corbella's experiences of leading change in multiple health systems in Catalonia.

After the case is taught, participants have a chance to speak with Dr. Corbella and ask him questions about how he successfully led change in a variety of roles during his career. Based on this experience, we have constructed this piece, in Q&A format, to highlight some of the common themes and lessons learned that have resonated with our audiences over the past three years.

**Dr. Corbella, I think one of the critical parts of your experience ties directly to the time you spent working on the front lines as a clinician and observing areas where you felt your health system was not serving patients. Can you explain how your experience as a physician informed your thinking as you became a manager, leader and change agent at Bellvitge University Hospital?**

I spent 12 years working on the 'front lines' as a practicing physician at Bellvitge University Hospital (Bellvitge), an 850-bed tertiary care public hospital for adults in Barcelona. As an attending physician, I frequently observed specific areas for improvement. My generalist, holistic medical training allowed me to see healthcare facilities as ill entities, not dissimilar to ill patients, with

## Introduction

I had the good fortune of being introduced to Dr. Corbella in early 2016 while visiting Barcelona to understand Spain's approach to primary care delivery. Our initial meeting evolved into a very successful collaboration in creating a teaching

case titled "Top to Bottom: Identifying Places to Change in Catalonia, Spain," for our Centre's primary care case collection (Arabadjis et al. 2016). Since publishing that case, we have had the privilege of invitations to speak in a variety of venues (Boston, Lisbon, Dublin, Barcelona) about how to lead change in complex health systems. Fondly dubbed our 'road

the possibility of diagnosis, prognosis and the potential to cure institutional problems. For example, I noticed a systemic lack of available inpatient beds for needy patients. This phenomenon leads hospitals to suffer waits, cancellations, and diversions that negatively affect patient safety and quality of care. Physicians are enormously concerned by, and pessimistic about, the barriers to accessing inpatient care. They try to alleviate these barriers by asking hospital executives for more beds, more buildings, and more staff. However, I considered this not only a financial resource problem, but also a larger failure of hospital-wide operational processes that could be remedied with the right interventions. This does not mean that my vision for change was not met with initial resistance from hospital management.

"I BECAME INTERESTED IN THIS KIND OF POSITION TO HAVE THE POWER TO CHANGE THE HOSPITAL"

#### **How did you manage this resistance and what helped you to persist in this situation?**

Most of the time, it was difficult for me to make change as a doctor and I realised further education, as well as seeking roles with increased responsibility, was the path forward. I decided to join hospital management to help my colleagues and my patients, to improve the organisation and improve health care for patients. As only a physician, I could not do many of these things so the only way was to become a manager – become the director. I became interested in this kind of position to have the power to change the hospital, to offer my colleagues and my patients new solutions for the daily problems they face.

Slowly, I rose within the management structure in my home hospital. In 2000, I was named assistant Medical Director of Bellvitge and five years later Medical Director at Althaia-Hospitals (Manresa, Barcelona). As part of the public system, it was common practice for managers to be promoted and moved around the health area by the regional authority. As medical director in Althaia Hospitals, my responsibilities were largely clinical and centred around patient care and coordinating care delivery. Again, I found that the position imposed limitations on my vision for care, and so decided to pursue an MBA to become CEO. I needed the expertise to change the system and realised I needed more tools to reorganise the hospital. I needed a better understanding of finance, operations, and strategy; while keeping my day job, I earned an MBA from ESADE (Escuela Superior de Administración y Dirección de Empresas) Business School. Subsequently, I was promoted to CEO back at Bellvitge.

#### **One of the things I'm noting is that you had a clear vision, which is certainly important for a CEO, but also for leading a major change effort. Can you talk about setting your vision when you started as CEO at Bellvitge?**

As a leader, my 'True North' that kept me on track as a hospital leader was the patient. A patient-centred vision drove all actions and decisions when I led Bellvitge through a series of changes. In order to remain patient-focused, I had to work collaboratively with clinical directors as well as the hospital board. I employed an action learning approach through which clinicians and administrators strived to learn together in order to collaboratively address management challenges. I consistently emphasised that patients were the reason for being, reminding them that Harrison's Principles of

Internal Medicine is the best healthcare management book. That meant that the clinical directors' role was focused on how to improve patient quality outcomes and the hospital board was concentrated on how to coordinate and lead multi-component interventions to create value for staff, individuals and their families.

#### **What you are describing here sounds like a bold, broad vision and new direction for Bellvitge. How did you achieve this vision and what helped you along the way?**

When I returned to Bellvitge as CEO of the hospital, I brought a vision that was not bound by the four walls of the hospital. At the time, Bellvitge was an overcrowded hospital in the middle of addressing the persistent lack of available beds. I recognised that part of addressing this issue was moving beyond the inpatient care towards the care continuum, and involving primary care in more prevention activities. The key point of our change was not thinking from only the hospitals' point of view. This is a typical error many hospitals and managers make, they only think inside the institution. You have to think more globally and extend your management to the patients that are at home so that you might prevent unnecessary hospitalisations and avoid complications.

Four months into my CEO role, I became a Territorial Manager which gave me joint management of Bellvitge, a small 120-bed primary hospital (Hospital de Viladecans), and the 53 primary care facilities of the Southern Metro Area of Barcelona. This allowed me to design a territory-wide reorganisation focused on greater integration between inpatient and outpatient care settings, which ultimately succeeded in increasing the efficiency and quality of care, and successfully decreased crowding, length of stay, complications, and hospital readmissions.

### Can you speak a little about the power, authority and resources you had to shift Bellvitge to a new model and way of working?

Leading a large-scale transformational change at Bellvitge required increased transparency at all levels of the health system in order to achieve buy-in and action from all stakeholders. My position as the newly-named single manager of both the hospital and primary care system sent an important signal about the integration and alignment needed between the two. I also embarked on a process in which I merged the three executive boards from Bellvitge, Viladecans, and the primary care basic health area to create one unified territorial board in the Southern Metro Area of Barcelona. This was to encourage shared decision-making and encourage the idea of a single organisation working towards the same goal. Part of sharing the same goal required re-aligning the budget to reflect the new, single organisation and a heightened focus on primary care and prevention.

### "A PATIENT-CENTRED VISION DROVE ALL ACTIONS AND DECISIONS"

In line with the budget adjustments, I also organised new professional roles within the system, establishing roles that were able to flex between primary care and hospital care to act as link consultants or conduct virtual visits. I also introduced integrated care pathways and a shared health information technology system to increase the transparency of care across patients, providers, facilities, and reporting structures.

### Conclusion

What is difficult to convey in words, and is clear when one has the opportunity to meet and engage with Dr. Corbella, is the passion he has in caring for patients and how much he believes in the work he does. He perfectly fits the archetype of an authentic leader. By that, I mean that Corbella discovered his purpose and was able to align his organisation around the same purpose while empowering others to lead. Corbella is also genuine, self-aware and transparent in leading others, particularly in times of change.

I think one of the most authentic things that Corbella has shared is that following his successful transformation at Bellvitge, he was promoted to be CEO at Sant Pau Hospital, a different university hospital in Barcelona. He became CEO at Sant Pau at a time when the global recession seriously affected Spain and major cuts were applied to public hospital budgets in Catalonia. Given the severe lack of hospital resources and the resulting protests and conflicts, Corbella had less authority to manage change. Unlike his time at Bellvitge, he was not authorised to bring the pieces together and unify the organisation around being a single, higher quality system. Following a frustrating year of trying to enact change from the top down, Corbella reflected and decided to return to his academic post at Bellvitge Hospital and the International University of Catalonia (Universitat Internacional de Catalunya) to train the next generation of internists and “to fight this battle from the bottom, in the white coat.” ■

### KEY POINTS



- Dr. Corbella developed insights regarding the changes needed to better serve patients through working on the front lines as an attending physician and being a keen observer.
- Leading change requires a willingness to learn and gather appropriate tools.
- Setting and communicating a bold vision is a key ingredient for any change effort.
- Exercise transparency, especially when allocating resources.
- Know yourself so you can lead change with authenticity; identify your passion and True North.



### REFERENCES

Arabadjis S, Ibrahim Z, Sullivan E (2016) Top to Bottom: Identifying Places to Change in Catalonia, Spain. Harvard Medical School Center for Primary Care.

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# How to Change Fertility Care with Value-Based Healthcare

Summary: The VBHC Green Belt Blended Learning programme gives medical specialists the tools to maximise patient value and deliver effective care.

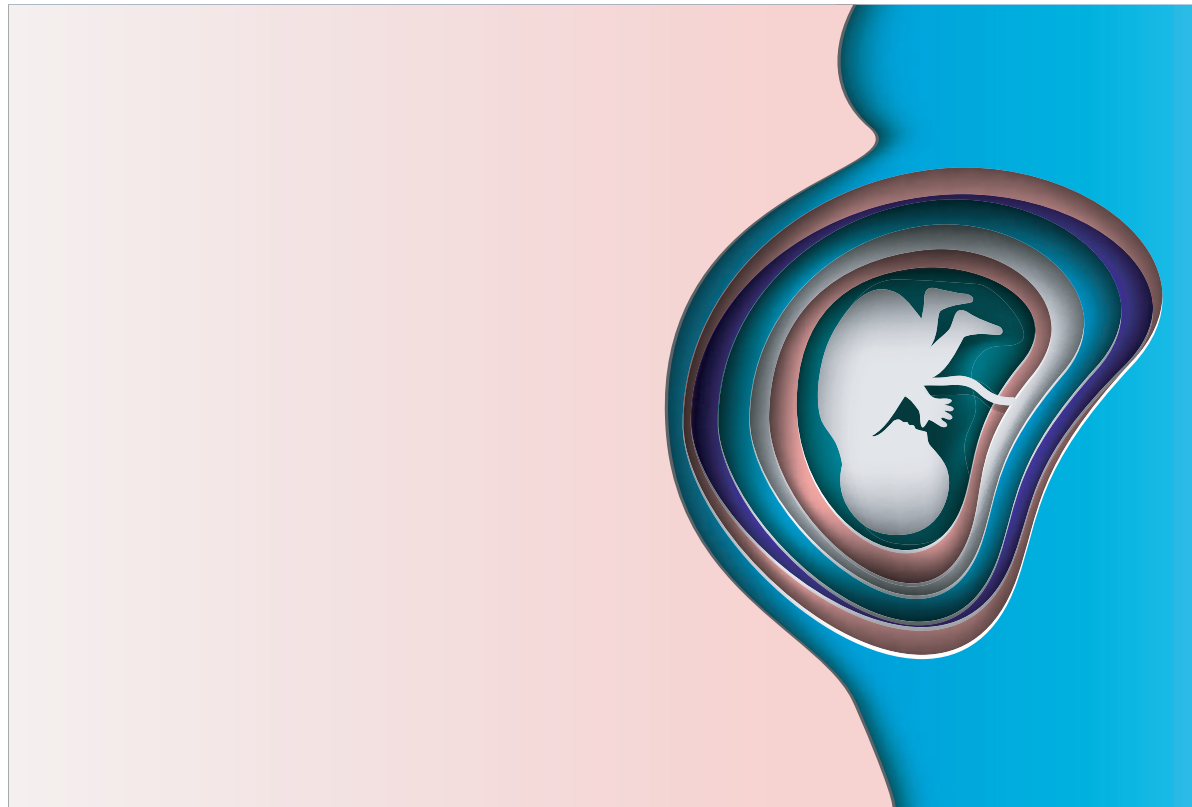


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**D**r. Max Curfs has been working as a clinical embryologist at the Isala Fertility Centre since 1995. He holds a PhD in Natural Sciences and before working at Isala he researched the embryology

of neuroanatomical pathways. He became enthusiastic when first coming into contact with Value-Based Healthcare (VBHC) and has been active in VBHC implementation ever since.

## When did you first become acquainted with VBHC?

I attended a lecture about VBHC during a strategic conference at Isala in 2016. I realised that many of our projects perfectly fit in the VBHC framework. It was like putting all the pieces of the puzzle together. Most importantly, it appeals to the intrinsic motivation of healthcare professionals: providing excellent care and being considerate to others.

## You completed the VBHC Green Belt track. What motivated you to follow this track?

One of our gynaecologists nearly completed the track, and he was enthusiastic. So, we (me and two colleague gynaecologists) looked into the programme and decided to apply. I needed more knowledge about VBHC since, being a scientist by origin, I never take something for granted without understanding the core. The sessions were challenging because healthcare professionals are not familiar with business administration and the way of thinking that comes with it. However, it was beneficial to me, even though it cost a lot of time and effort. It provided me with the knowledge I required. I would advise other healthcare professionals to hold on to their vision and convince others of the shared purpose. Make sure you have the knowledge to be critical.



## What were the challenges for patients of the Fertility Centre, and how did VBHC help to overcome these challenges?

The outcomes we measured from the beginning of IVF (in vitro fertilisation) onwards were not the outcomes which genuinely matter to patients. We were used to quick results per treatment cycle but what matters to patients are the outcomes — being present for the entire patient journey, from the first referral to the fertility centre until discharge of the patient and their partner. Such a journey is highly variable per patient. The patient wants to know what is involved in having a living and healthy child at the end of the treatment and how long it will take. With the help of VBHC, we are now able to measure and show the results, which are relevant to the patient.

## How did you apply the knowledge gained during the sessions in your daily work?

The VBHC Green Belt track made me look critically at the way we work. In the beginning, you feel like 'Alice in Wonderland,' gaining lots of new impressions without being able to put them into perspective. But as I went along, I began to understand what the concept was all about. The most important thing to remember is that there is no perfect route. You need to do what suits the patient, healthcare professional and the medical leader. I learned that I have to follow my vision and passion. Implementation of VBHC is not a matter of copy and paste.

## What are your plans for the VBHC project?

We have big plans! First, we have to complete the formula: we already have a complete outcome-measures set. We are now working on an accurate overview of the costs, which will allow us to focus more on health outcomes and costs to improve patient value. Next, we are going to present our results transparently, both nationally and internationally,

so patients and health insurers can see what they get for their money. We want to compare these results with other healthcare professionals. The initial contacts have been made with organisations in the Netherlands and also in Scandinavia.

## "IMPLEMENTATION OF VBHC IS NOT A MATTER OF COPY AND PASTE"

### Would you recommend the VBHC Green Belt track to your colleagues?

Yes, I would recommend the VBHC Green Belt track to my colleagues. It is quite an investment but worth it. It is essential to find the knowledge and The Decision Institute has this knowledge. Gaining theoretical knowledge about VBHC is vital to sail your own course and to not chase others. You have to discover your path and should allow yourself to make your own mistakes.

### VBHC Outcomes at Isala Fertility Centre

Isala Fertility Centre started with the implementation of VBHC in 2017 with the help of a consultant. The multidisciplinary team defined the medical and patient outcomes along with the care pathways. As the patient has a clear idea of what matters to them, patients also participated in the group. Being just underway, the analysis of the medical outcomes already resulted in cost savings, especially for the insurers, by decreasing the number of treatment cycles given. Isala showed that after a given number of treatment cycles, the chance of further success, ie the possibility of becoming pregnant, was negligible. With this data available, other decisions are made in the consulting room. Isala also uses questionnaires to periodically measure the quality of life of the patients and their partners. Therefore, if observations are made on impaired or reduced quality of life, the Centre can act accordingly.

## Become a VBHC Certified Green Belt

Would you also like to become a Value-Based Healthcare expert and be recognised for it? Follow the interactive VBHC Green Belt Blended Learning programme in which you will be trained to become a Certified VBHC Green Belt.

### What is It? How Does It Work?

- The VBHC Green Belt Blended Learning programme is for medical specialists, board members, dedicated VBHC teams and international healthcare professionals who aspire to maximise patient value, are keen to deliver effective care in a more efficient manner, and would like to receive tools with which to implement VBHC in their own health care organisation.
- In four interactive sessions, you will learn about the essentials of VBHC by covering theory and Harvard Business School cases.
- The VBHC Green Belt Blended Learning programme is online and flexible. You can follow the sessions in any order.
- In the past ten years, more than 28,000 healthcare professionals have taken VBHC education with The Decision Institute. On average the programme is rated with an 8.7.
- Prepare for the VBHC Green Belt exam with the VBHC Centre Europe. Once passed, you will become a Certified VBHC Green Belt.

Prefer to become a Certified VBHC Green Belt in two days? Then the 'Intensive VBHC Green Belt Track' would be a perfect option for you. The next 'Intensive VBHC Green Belt Track' will be on the 9-10th of January 2020.

Please visit [thedecisioninstitute.org/vbhc-green-belt-blended-learning/](https://thedecisioninstitute.org/vbhc-green-belt-blended-learning/) for more information on details, dates, the programme and fees. ■

# Managing the Whole Health of the Ageing Population

Summary: With a rapidly growing older population, effective care for ageing patients will require healthcare stakeholders to collaborate in managing the whole health of these patients.



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Throughout the world, but especially in Europe and Northern America, the population is ageing at an alarming rate. The United Nations Department of Economic and Social Affairs estimates that by 2050, older persons (aged 60 or older) will account for 35% of the population in Europe, and more of these persons are living independently than ever before (United Nations 2017).

These predictions should serve as a call to action for healthcare stakeholders. The importance of managing the whole health of ageing citizens will continue to skyrocket, and that effort will require commitment and cooperation from healthcare providers, healthcare IT vendors, government leaders, and others.

My KLAS Research colleagues and I have interviewed thousands of healthcare leaders about their software tools. These providers have taught us which tools and practices yield the best outcomes and which technologies need the most improvements. With this data in mind, I would encourage healthcare organisations to do the following in order to effectively help the ageing population:

- Partner with your vendor(s) on a solid population health management strategy.
- Take full advantage of remote patient monitoring tools; and
- Increase the focus on interoperability between acute, primary, and post-acute care facilities.

## Partnership in Population Health Management

Healthcare stakeholders understand that there is no easy way to reduce the number of health crises that send patients to the hospital. The best tactic for many healthcare organisations is to focus on the whole health of particular groups of patients, typically high-risk patients such as the ageing. In other words, these provider organisations create population health management strategies.

Population health IT includes tools for data aggregation, data analysis, care coordination, finances and administration, patient and family engagement, clinician engagement, and more (KLAS Research 2016). Population health management could be defined as the coordinated application of population health IT tools. Effective population health

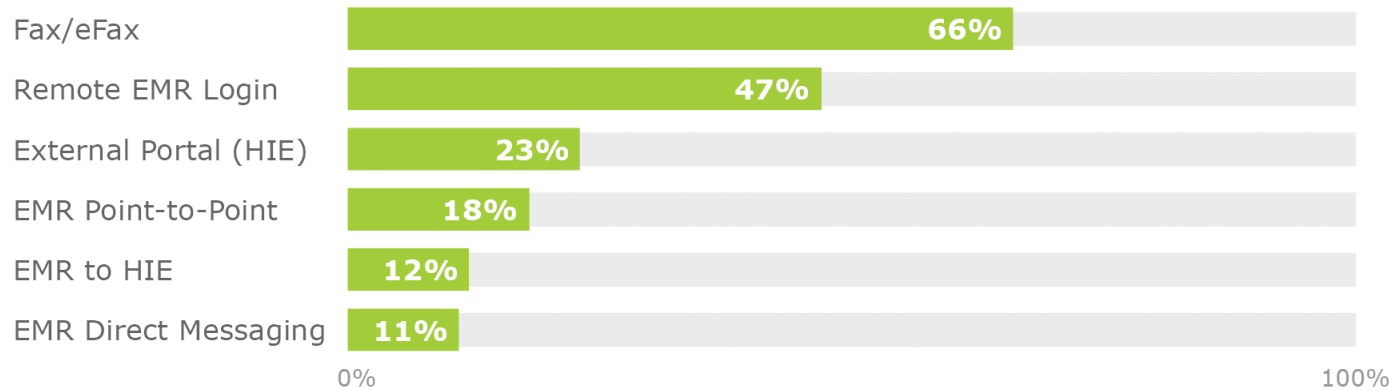
management can improve and preserve the health of the ageing population by increasing the quality and value of care.

In a 2018 KLAS study on population health management, participants' responses showed that "vendor partnership and guidance are the x factors provider organisations need to drive success" (Hunter and Warburton 2018). The vendors who received higher scores on questions related to their partnering efforts tended to receive higher scores on their products. This was probably because the providers who received more vendor help and training could use the tools more effectively. One study participant stated:

"[Our vendor] does a great job of optimising our available functionality. When we first rolled out the product, [our vendor] made themselves available to do in-person training. Our facilities are spread over a large area, and [our vendor] still made themselves available for in-person training at each of our facilities. [Our vendor] also made follow-up calls to make sure that they understood things, and they offered web-based training for anyone who might need it. [Our vendor] was able to tailor how they gave assistance so that the assistance made the most

## How Post-Acute Providers Access Outside Data

(n=154)



**Figure 1.** How Post-acute Care Providers Access Outside Data

sense to our users. They spent a lot of time with our users” (Hunter and Warburton 2018).

Other happy customers described vendors who meet with provider organisations weekly, include needed functionality on transparent road maps, and work with the provider organisations toward the same goals. In short, providers with engaged population health vendors are able to do more for their patients.

**"75% OF US HEALTHCARE SPENDING GOES TO TREATING CHRONIC CONDITIONS, AND 77% OF OLDER PATIENTS HAVE AT LEAST TWO OF THEM"**

This data shows how much responsibility population health vendors bear. But what can provider leaders do if

they aren't satisfied with the relations with their vendor? First, the provider organisation should confirm that both parties share a vision. If not, considering a different vendor might be beneficial. Once a vision has been agreed upon, provider leaders can invite the vendor to participate in conversations about population health management and the respective parties' road maps. The parties must also agree on their individual responsibilities and set up an effective feedback mechanism.

### Remote Patient Monitoring

Ageing patients are easily the most expensive ones. One reason for this is that they tend to have the most chronic health conditions. 75% of the United States' healthcare spending goes to treating chronic conditions, and 77% of older patients have at least two of them (National Council on Ageing 2018).

Most healthcare organisations already know that managing patients with chronic conditions is key to reducing admissions to hospitals and long-term care facilities. But relatively few health systems have harnessed the power of remote patient monitoring (RPM) technology.

In 2018, KLAS Research partnered with the American Telemedicine Association to complete and publish a report on RPM; providers from 25 healthcare organisations were interviewed about their RPM software. We found that RPM tools have become indispensable to many providers, particularly those caring for patients (including older patients) who have chronic conditions (Sharp and Buckley 2018).

With RPM technology, patient's health data is digitally collected and sent to healthcare providers, who can then track and assess the data. Customisable alerts let caregivers know when the patient needs attention. Some of the most advanced RPM software also offers disease-specific care plans that can be tailored to the individual patient. These capabilities have become favourites of healthcare providers and can save many trips to hospitals and other facilities.

Furthermore, a number of healthcare IT vendors are adding patient-education content, reminder functionality, and communication tools to their RPM software. Many patients can use the software for video conferences. Instead of travelling for an office visit, a patient can participate in a video call with their doctor and maybe even loop in a family member or other caregiver to the same call. RPM software can also cue patients to take medications, complete periodic surveys, or do other things to preserve their health.

The following excerpt and chart from the report illustrate RPM technology's potential for good:

## Key Outcomes Achieved

(n=24)

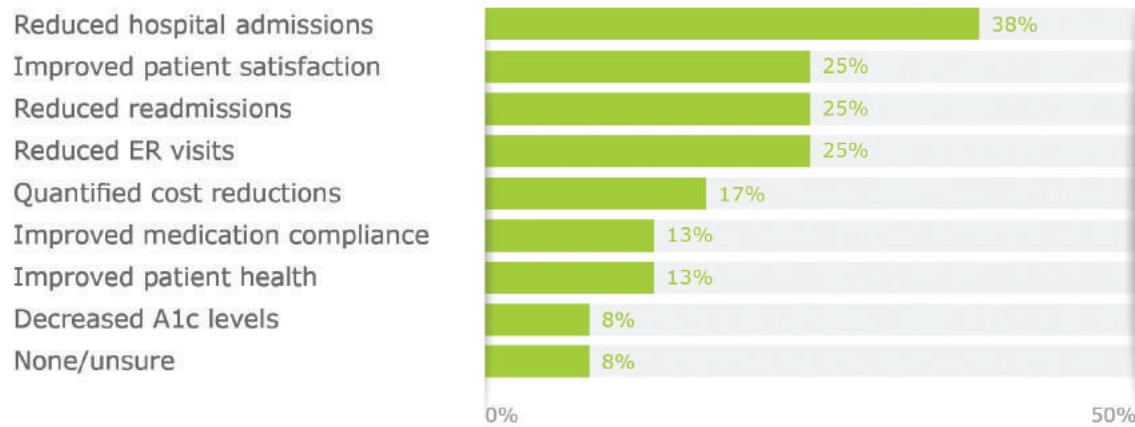


Figure 2. RPM Outcomes Chart

“The majority of study participants are very pleased with the success of their RPM programs. Most have achieved measurable outcomes, particularly when it comes to keeping patients out of the hospital (ie admits, re-admits, and ER visits). Even those earliest in their RPM journeys share anecdotal victories, and only a few hesitate to call their efforts a success—not because of failure, but rather because of blurred lines between vendor monitoring and their own outreach work. Heart disease and COPD are the leading use cases, but organisations are branching out to less acute chronic diseases, such as diabetes and hypertension” (Sharp and Buckley 2018).

Of course, RPM software is no silver bullet; stakeholders will need a few years to hone this new technology and related best practices. However, vendors are beginning to offer pay-as-you-go models, value-added software, and vendor-managed logistics that are allowing

more providers to make use of RPM tools. Even in this development phase, RPM software can allow providers to keep an eye on their high-risk patients, encourage family involvement, and help keep ageing patients healthy at home.

### Increasingly Necessary Interoperability

Certain small victories in interoperability have been achieved in recent years. However, most healthcare organisations still have a long way to travel before achieving the ideal level of interoperability. KLAS Research’s 2018 report on the UK National Health Service (NHS) interoperability found that “even those NHS organisations with full integration don’t meet all clinician needs since their use cases are limited to ingesting results or transferring data from one GP to another who uses the same supplier” (Goff and Christensen 2018).

The post-acute space is falling particularly behind. Because post-acute care is less urgent than acute care, interoperability solutions for post-acute facilities receive less attention and funding than the solutions for hospitals. This means the ageing population doesn’t receive as many interoperability benefits as they should. As seen in a chart from a recent KLAS Research report on post-acute interoperability, most providers in the post-acute space (which includes the elderly-dominated long-term care) still rely heavily on faxing (Bermudez and Buckley 2018).

To be fair, faxing is quite convenient for many of the task-oriented providers at long-term care facilities. However, the industry is heading in the direction of normalised, integrated data from many sources, and as the older population grows, the importance of being able to share these patients’ health data digitally will grow as well.

To achieve the kind of interoperability that patients need, several roadblocks will need to be removed or circumvented. The first may be that too many providers—particularly in the post-acute care space—don’t know much about their interoperability tools. KLAS Research has found that “even leadership at post-acute care organisations regularly expressed uncertainty about what Electronic Medical Record-based interoperability tools they might or might not be using—a clear sign that vendors can improve communication around this important topic” (Bermudez and Buckley 2018).

Another barrier is, of course, money. Long-term care and home health organisations have notoriously low business margins and often can’t afford the high prices that Electronic Patient Record (EPR) vendors have traditionally charged for interoperability features. Vendors are beginning to abandon these traditional fees, but that change must be solidified.

The speed at which interoperability spreads will depend heavily on EPR vendors. If EPR vendors want their customers to be successful, they must offer affordable interoperability solutions that are easy to use, help providers understand the benefits of interoperability, urge customers to fully adopt the functionality, and provide thorough training for the clinicians.

## "THE INDUSTRY IS HEADING IN THE DIRECTION OF NORMALISED, INTEGRATED DATA FROM MANY SOURCES"

Provider organisations that aren't seeing such efforts from their EPR vendors can push for change. If provider leaders stay aware of what is happening with interoperability in the industry, they can use that knowledge as leverage with their vendors. In addition, provider leaders can make sure that their own organisation and their EPR vendor each have interoperability on their road map and that both sides have agreed on a way to achieve interoperability together.

As stakeholders continue to work together toward greater interoperability, particularly in the post-acute care world, they will create a better world for all parties, including the ageing population. Clinicians will have access to enough data to focus on the whole health of their patients, and patients will be spared from many clinical errors and receive quicker diagnoses and care.

## Conclusion

The ageing population needs healthcare IT vendors, healthcare providers, and government leaders to understand the post-acute care space and how to care for the whole health of a patient. The following are steps I would encourage these stakeholders to take in order to help older patients:

- **EPR and Population Health Vendors:** Get to know your customers and form close relationships with them. Share your road map and make sure your goals are aligned with your customers'. Teach customers how to leverage all of their tools in a way that can help them establish a longitudinal record.
- **Healthcare Providers:** Implement and use tools (such as RPM software) that can help you be proactive in caring for your patients. Get patients and their family members involved and use the appropriate tools. Collaborate with your EPR and population health vendors; and
- **Government Leaders:** Use your influence to encourage interoperability, technology development, and certification processes for tools such as EPRs. Create a landscape of financial support and reimbursements that will allow healthcare providers to invest in effective tools and best practices. ■

## KEY POINTS



- Provider organisations will find the most success in population health management strategies when they partner with engaged vendors.
- Remote patient monitoring is reducing hospital-admittance rates and helping provider organisations engage their ageing patients.
- Interoperability between acute and post-acute facilities will become increasingly needed as the older population increases.
- Stakeholders must work toward ambitious interoperability goals in order to ensure progress.



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# Opportunities and Risks of Digital Health: Older People's Perspective

Summary: The publication of the European Commission Strategy for Artificial Intelligence in April 2018 kicked-off a heated debate on healthcare tech. AGE Platform Europe joined the discussion with Europe's senior population at the forefront of their agenda.



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## Promising Outcomes, Threatening Systems

Artificial intelligence has become a key research area in many fields in Europe: be it machine learning algorithms capable of detecting behaviour related to early onset of Parkinson's disease (i-PROGNOSIS) or virtual conversational coaches providing real-time recommendations to support active and healthy ageing (NESTORE), the health sector is not outdone. As a representative of older Europeans, AGE has been invited to join several research and innovation projects developing solutions using artificial intelligence (AI) for ageing well.

These concrete solutions – though still under development – are illustrative examples of what could soon be part of our daily lives. Living with phones smart enough to identify signs of chronic diseases when we type a text, or home assistants like Google Home or Amazon Alexa capable of recommending what is best for you to stay fit are no longer sci-fi plots. Those so-called 'smart' solutions are being developed while we write this paper and could be on the market sooner than later for us to stay fit and healthy as long as possible.

The longevity challenge is a gold mine for the developers of those solutions. AI carries important promises of more personalised and preventive medicine, proposing interesting responses to the ambition of increasing life expectancy. The challenge remains to tap

the potential of these new systems for sustaining healthy ageing without sacrificing people's fundamental human rights while we develop, operate or use these systems.

## Human Support Cannot Be Replaced by Facebook

The report of the United Nations' Independent Expert on the impact of robotics and assistive technologies on older persons' enjoyment of human rights (July 2017) provides with an interesting perspective on how the current legal and policy frameworks fall short to ensure that technologies are used as enablers of autonomy, inclusion and participation in old age.

If Europe is at the forefront of data protection worldwide, as the European Fundamental Rights Agency recalls in its 2018 handbook on European data protection law, several risks remain in relation to lack of transparency and accountability when decisions are made by "black box" systems. As the lawyer Sandra Wachter stresses, we still lack binding legal provisions to enforce a broad "right to explanation" (Matsakis 2018) for how a machine came to a conclusion about your life.

These explanations are critical to provide recourse; they should cover both how the decision was taken and what could be done to reverse it in case it is proven discriminatory, or inaccurate. These risks of unfair decisions are especially high if no efforts are made

to ensure machine learning algorithms are fed with representative datasets – a challenge that will not be possible to meet if we do not address the digital divides that keep many groups away from the most recent technologies.

Beyond those legal and technical considerations are a number of political ones: there is no question about the added-value digitally-enabled (especially AI) solutions can bring to society. As former AGE Platform Europe president, Liz Mestheneos writes: "AI does not get tired, sick, fed up nor does it forget: thus, it can act 24 hours a day to support humans, professionals and patient, with information and data" (Mestheneos 2019).

What we want to do with the human capital we will save with machines making decision for us is a political decision, however. Mestheneos writes: "AI, although discussed in terms of diagnosis, offers possibilities in reducing the current amount of time spent by doctors and health professionals in administration and allowing more face to face time and human contact" (Mestheneos 2019).

Is that the route we will take? Will we allocate more time to meet, look at each other, care for one another? "Even if AI turns out to be better at diagnosis and some kinds of treatment, the human support people need when in crisis and pain cannot be replaced by Facebook, robots, AI and its likes – though there is a role for these too."

Research shows that technologies are just another area reflecting the many socio-economic inequalities that already impact people's health. Those who would most need those technologies to adopt healthy behaviour, be diagnosed early, or receive care are also often those who are the least technically aware and/or have less financial capacity to access those technological solutions.

## Major Shift Needed

Adopting a genuine ethical approach to health technologies is a bigger shift than it seems. It will imply to eradicate ageist assumptions that older people are technophobes and thus cannot be associated with the design, development and use of new technologies. It will be required from stakeholders in the field who are building and operating those technologies but also from those that are setting the frames for those technologies, be it law-makers, policy-makers, or standardisers. A recently-closed European project defined ethical underpinnings that should be considered in ICT standard development for active and healthy ageing (PROGRESSIVE).

It will also need to move away from the hierarchical dynamics that traditionally rule patient-doctor relationship: "We have to recognise that many of our health services are stuck within a top-down approach" writes Malcolm Fisk, Chair of Age Cymru in Wales, UK and coordinator of the PROGRESSIVE project. "Neither word (patient and delivery) allows for new ways of thinking that, perhaps, encourage more partnership approaches to health or suggest that people might, except in the most limited of circumstances, take responsibility for the management of their health conditions" (Fisk 2018).

The work conducted by AGE in the area of digital health relies on two legs: first, an active involvement in EU funded projects, like i-PROGNOSIS, FrailSafe or Maturolife; secondly,

policy and advocacy work through initiatives like the European Innovation Partnership on Active and Healthy Ageing or the eHealth Stakeholders Group, with strong interconnections between the two.

Whatever the channel used, we do convey the same main messages:

- Solutions must be developed in sound and genuine partnership with users and not for users in order to make the most of the experience and expertise of older persons. As stated by the World Health Organization, "older people are the ultimate experts of their own lives" (WHO 2007).
- Any solution should comply with the 'triple A' rule: accessibility, affordability and availability. These criteria are crucial to close the digital divides and avoid creating further inequalities, including geographical ones. If the digitalisation of the healthcare sector can enhance access to services, it can also further exclude persons in vulnerable situations.
- Human rights impact assessment should always be included as a security net to make sure that the developed solutions respect key principles such as people's dignity, freedom and security, equality and non-discrimination.

AGE recently joined the European Alliance in Artificial Intelligence; this group will collect statements from different societal and economic stakeholders in Europe to steer the development of the EU policy frame around AI.

AGE also keeps strong partnerships with other societal NGOs and consumer organisations working on the issue. For instance, it joined the initiative coordinated by the European Consumers' Organisation (BEUC) and the Open Society European Policy Institute (OSEPI) to develop a "A Human Centric Digital Manifesto for Europe," a civil society compilation of the next

wave of policies the EU needs for a digital transformation in the public interest.

The task is tremendous and requires more than just caution. The range of possibilities provided by artificial intelligence makes it compulsory to debate the topic widely. We cannot forgo this dialogue, and older persons as any other citizens, need to be part of it. ■

## KEY POINTS



- AGE has joined several projects which use AI for ageing well.
- The current legal and policy frameworks for new technologies do not ensure inclusivity for older people.
- AI technologies cannot replace human interaction.
- Individuals most in need of new technologies for care are often unable to access them due to socio-economic inequalities.
- If we are to take an ethical approach to health technologies, we need to eradicate ageist assumptions.
- AGE aims to improve digital health by its involvement with EU-funded projects and through its policy and advocacy work.



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# Anti-Ageing Therapies: From Basic Science to Human Application



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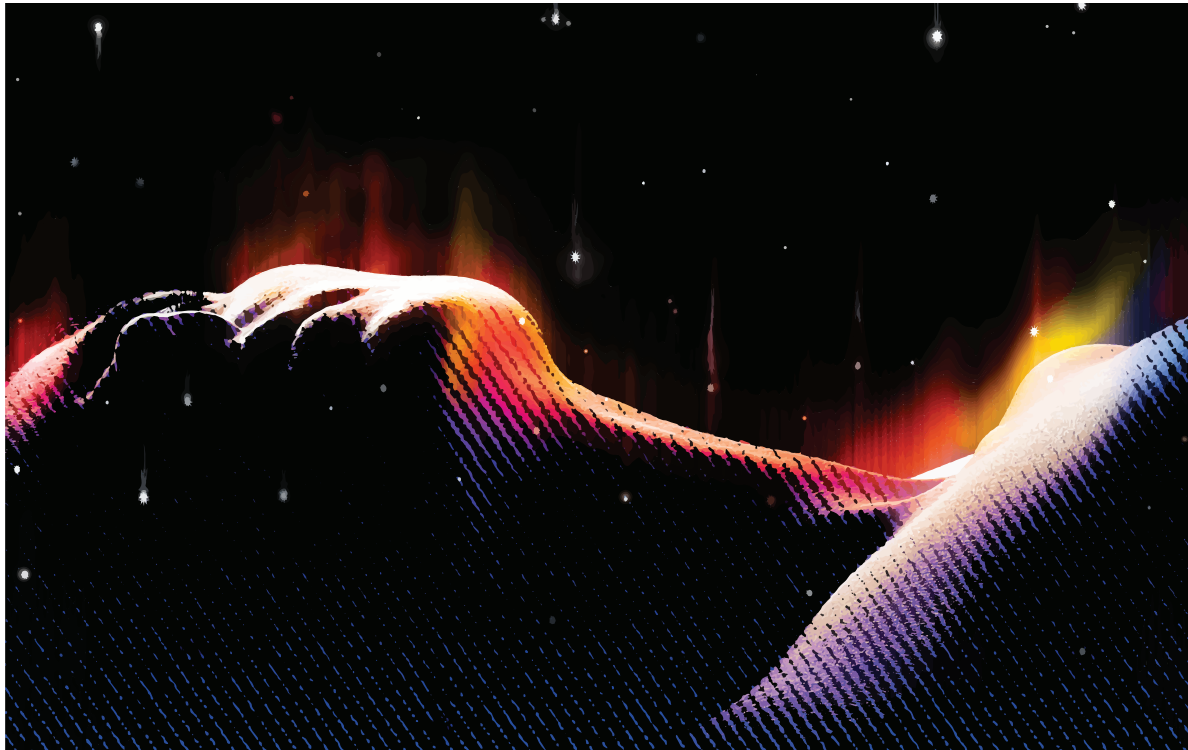
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Summary: At the turn of the twenty-first century, our understanding of the biology of ageing has fundamentally changed thanks to major preclinical breakthroughs, which revived age-old aspirations for eternal youth. However, how close are we, in reality, to achieving this in humans?



## Background

Nowadays, the average human lifespan exceeds 80 years in many countries around the globe, compared

to 30 years at the beginning of the 19th century. Improved public health awareness combined with the discovery and further development of antibiotics and vaccines have played an essential role in this

expansion of human lifespan as they helped plummet early-life mortality caused by infectious diseases and malnutrition. Although late-life mortality has also been reduced due to medical advancements in disease-specific interventional and pharmaceutical remedies, the gains in late-life healthy years have proved more challenging. Some have attributed this fact to the so-called competing risks phenomenon, where the prevention or cure of a specific disease, for example atherosclerotic heart disease, is soon replaced by another one which can be more debilitating, such as Alzheimer's disease. Hence, the conventional approach to single out diseases and treat them one at a time does not seem to be effective for major gains in healthy life years in the elderly. Instead, targeting ageing as a common denominator of most chronic diseases might prove more successful in extending human healthspan, ie the disease-free period of life (Olshansky 2018).

## Dietary Restriction: The Holy Grail of Healthy Ageing

Although fasting or dietary restriction, ie reduced caloric intake without incurring malnutrition, have been practiced for thousands of years, their impact on ageing has only been rigorously studied in modern history. Almost a century ago, a remarkable lifespan



extension was observed in laboratory rats subjected to limited food access compared to their ad libitum-fed counterparts. Hence, reduced energy intake attracted major attention as a potential remedy for ageing; especially since it is more modifiable than other known determinants of our biological age, like socioeconomic and genetic factors. More recently, a plethora of studies have validated the beneficial impact of caloric restriction on ageing and extended it to other animal species, including non-human primates. More importantly, caloric restriction has also been shown to extend healthspan, as it can confer protection against metabolic abnormalities in glucose and insulin homeostasis, and various cardiovascular risk factors (eg high blood pressure and lipids).

It is now well-accepted that dietary restriction exerts these beneficial effects on health and lifespan via diverting energy utilisation from growth, towards cellular maintenance and quality control. This, in turn, improves stress resistance and enhances cellular function through the activation of various cellular adaptive and homeostatic processes. However, despite such astounding benefits, caloric restriction does not seem to be suitable for adoption as a long-term lifestyle, let alone clinical practice, for a couple of reasons. Firstly, following strict dietary regimens for extended periods is generally challenging for the majority of people. Secondly, it remains unclear whether the elderly can tolerate chronic caloric restriction for long periods without incurring adverse effects, especially in those suffering from chronic multimorbidities, injuries and infections. To this end, it was imperative to define the specific molecular targets through which caloric restriction counteracts ageing and exploit them to develop bona fide therapies that could promote health similarly to caloric restriction, but are easier and safer to apply.

## Successful Preclinical Anti-Ageing Interventions

Once ageing was established as a biological process, ageing was not untargetable any more. In fact, one can argue that the major accomplishment of preclinical ageing research is the identification of a subset of cellular processes and targets that determine the pace of ageing clock. One such molecular target is the mammalian target of rapamycin (mTOR) which is a nutrient sensor and a master regulator of cellular metabolism. During times of nutrient sufficiency, mTOR stimulates growth; meanwhile during energy deficit, it promotes cellular maintenance by activating catabolic processes, such as autophagy ('self-eating' in Greek). Interestingly, mTOR inhibition by rapamycin, an FDA-approved immunosuppressive drug, extends the lifespan of mice by more than 30%. However, rapamycin incurs side effects on glucose control and diabetes, thus, alternative mTOR-modulating drugs that are more specific and, more importantly, safer are needed. One such alternative to rapamycin could be the first-line anti-diabetic drug metformin, which inhibits mTOR via another major metabolic regulator known as AMPK (AMP-dependent kinase). Metformin effectively extends the life and health spans of mice; similarly, diabetic patients receiving metformin show lower incidence of cardiovascular disease, cancer and cognitive dysfunction in addition to improved overall survival. Interestingly, joint administration of metformin and rapamycin was found to be even more beneficial in delaying ageing than either alone as reported by the Interventions Testing Program (ITP) - a programme funded by the National Institute of Aging in the USA with the goal of investigating various treatments for the extension of lifespan and retardation of disease in mice. The ITP programme also reported lifespan extension by another

anti-diabetic drug, acarbose, (in both sexes) and by the nonsteroidal anti-inflammatory drug aspirin (in males only).

## "TARGETING AGEING AS A COMMON DENOMINATOR OF MOST CHRONIC DISEASES MIGHT PROVE MORE EFFECTIVE THAN TREATING THEM ONE AT A TIME "

Another potential anti-ageing, but natural compound, is spermidine, which is endogenous to our bodies and exists in different amounts in our food (Madeo et al. 2018). Spermidine has a unique intrinsic ability to induce cytoprotective mechanisms, such as autophagy, which is responsible for the disposal and recycling of dysfunctional cellular components. Spermidine feeding to mice, either early or late in life, extends their median life span and exerts multiple cardiovascular beneficial effects (Eisenberg et al. 2016). Interestingly, spermidine levels decline with ageing in humans and exceptionally old individuals with preserved health demonstrate higher circulating spermidine levels. Another natural substance with anti-ageing properties include the sirtuin activator resveratrol, which has been shown to exert various beneficial effects against ageing and metabolic dysregulation in mice and monkeys, yet those benefits were largely disputed in humans due to bioavailability and specificity issues.

## Anti-Ageing Pills for Humans: Myth or Work in Progress?

Generally, translating preclinical findings to humans is very defiant with only a handful of effective interventions in animals making it to clinical practice. In the field of

geroscience, this is even more challenging as humans are a relatively long-lived species and, thus, clinical confirmation that a drug effectively extends lifespan would take decades. That said, emerging anti-ageing therapies are now starting to be clinically tested for efficacy in specific age-related diseases. For instance, a low non-immunosuppressive dose of mTOR inhibitors, given for 6 weeks, has been shown to be well-tolerated in the elderly and to improve their response to influenza vaccination and to lower the rate of infections over the following year. Albeit in early phases, this is a great example of a successful clinical trial of a drug that essentially targets a mechanism of ageing (Campisi et al. 2019). Another example is the antidiabetic drug metformin, which will be tested within the placebo-controlled trial TAME (Targeting Ageing with METformin) for anti-ageing properties in non-diabetic older adults. Particularly, the TAME trial will examine whether metformin can delay the development or progression of common age-related chronic disorders, such as cardiovascular disease, cancer and dementia. Other medications that have been tested in humans include aspirin which despite being known to exert protective effects during secondary prevention of cardiovascular disease, did not show anti-ageing effects in healthy elderly at low-doses. Aspirin was surprisingly found 'not' to be superior to placebo in extending disability-free survival or reducing all-cause mortality. At this point, however, it is

worth mentioning that optimal, instead of fixed, dosage and timing of administration (ie chronotherapy hypothesis) might help reveal the anti-ageing effects of aspirin in humans as well. Finally, other compounds, such as spermidine, which is supported by epidemiological evidence linking its dietary intake to improved overall survival and cardiovascular health, still awaits testing in randomised clinical trials, despite the already established safety profile in the elderly.

## Conclusion

Targeting ageing per se appears to be the most promising approach to tackle population ageing and related morbidity. In this regard, major preclinical strides have been achieved and more are expected to come. These experimental findings are being exploited not only to extend our lifespan, but more importantly, our healthspan. This is further supported by the growing realisation that extending our lifetime lived in health either by extending total lifespan or just compressing the late-life period lived in disease is far more critical than gaining extra years lived in disability and frailty. Although the venture for an effective anti-ageing pill is still in its start, the benefits will eventually far outweigh the risks. In fact, with the ever-growing investment in longevity research, that - as-of-yet fictitious - anti-ageing pill might one day become a reality! ■

## Acknowledgement

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## KEY POINTS



- The major goal of ageing research is shifting towards extending healthspan, not lifespan.
- Several pharmaceutical and natural compounds have shown promising anti-ageing outcomes preclinically.
- Ongoing human testing of anti-ageing therapies is bound to grow and, one day, succeed.



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# Ageism in Healthcare: Why It Has To Stop

Summary: Ageism can be defined as stereotypes, prejudice and discrimination towards people because of their age. An authority on ageism in healthcare highlights the challenges and opportunities in the sector



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## How serious/prevalent is the problem of ageism within healthcare and where do you think this stems from?

I don't think that the problem of ageism is pervasive only in healthcare, but in each and every aspect of our lives. I think it's better to regard ageism as being manifested in a variety of settings and a variety of levels; the micro, the meso, and the macro-level rather than limiting the focus to just the healthcare system. I do think it's a major issue in the healthcare system and maybe one reason why it is so is because we have a limited amount of money. There is only one cake that has to be divided among different consumers and different clients. Old people are closer to death, and we know that the last year of life is usually the most expensive year. Healthcare providers and the healthcare system, I think, associate old age with depletion of the healthcare system. At least one explanation for the very pervasive manifestation of ageism in the healthcare system is because old people are looked at as consuming too much of healthcare resources.

Another explanation is, I think, that we have a general tendency to disassociate from people who remind us of our own mortality. Old people, especially in the healthcare system, are usually there when they are very frail and fragile. I think that both healthcare providers

and the general public try to disassociate from frailty and from people who are sick and ill because it really reminds them of their own imminent death.

## How can healthcare ageism have a detrimental impact on delivering effective care?

We see it in a variety of levels in the healthcare system. Basically, we know that old people usually are the ones who receive less expensive and less innovative treatments compared to young people. We also know that there are very few healthcare providers, or at least fewer healthcare providers, who wish to work with old people compared to working with young people. We know that old people are often banned from participating in clinical trials, even for conditions that actually are more likely to occur in old age, such as dementia or heart failure. We also know that physicians and other healthcare providers would treat the exact same disease differently based on the age of the patient. I think these are all ways healthcare ageism impacts the care provided to old people.

## Are there any countries or regions that have been successful in mitigating the impact of healthcare ageism?

There was recently a systematic review and meta-analysis that tried to look at different interventions

to address ageism. What they found was that both educational interventions and inter-generational contact are quite effective in reducing ageism, but I think that ageism is really a worldwide problem. The reason that it is really so prominent in each and every country is what led the WHO to initiate the campaign in 2016 to combat ageism to make sure we all live in a world for all ages.

## In brief, can you provide examples of successful case studies/pilots where healthcare ageism has been encountered?

I think that when we are encouraging inter-generational contact on equal basis, that is one place where you could potentially target ageism. If people of different generations learn to work together and like each other and appreciate each other's strengths and weaknesses that's one place. I think we have a long way to go to really utilise this resource but it's definitely a resource. We also know that education can be effective. However, I would say that there is reason to show that actually much of the time, people who work with old people, geriatricians for instance, become more ageist with time rather than less ageist. I think that education alone is not enough and we really have to process attitudinal changes as well if we want to combat ageism.

### What projects are you focusing on right now in the field of countering healthcare ageism?

We recently concluded a systematic review that looked at the psychometric properties of different measures to assess ageism. What we found was that there aren't any measures of good enough psychometric properties to assess ageism. This has led us to the understanding that now we have to develop a very good measure of assessment. I think the first step in fighting ageism would be to find a way to operationalise it and to assess it well enough to capture this very complex construct before we do any interventions.

### Conversely, where is it less obvious but still damaging?

I think that there is a distinction between explicit ageism and implicit ageism, and we are not all aware of ageism yet, it might really affect our own behaviours towards our own ageing and our behaviours towards others ageing. I would say that implicit ageism is still quite damaging and the way people think about their own ageing definitely has an effect on their health. There is enough research to show that thinking negatively about your own ageing makes an impact. People who think negatively about their own ageing are more likely to have frequent falls, they are less likely to recover from illness, more likely to report impaired mental health and even more likely to die before people who think positively about their own ageing.

I would say that definitely implicit ageism can really guide our health behaviours and affect our health. I would say that this is very pronounced both on the consumer end but also with providers. Many healthcare professionals are not even aware that they are being ageist but they will operate based on their ageist assumptions. They will allocate resources

differently and might ban old people from participating in rehabilitation, for instance, simply because of their age.

### What advice would you give to the C-suite/management level on the topic of fighting healthcare ageism? How damaging can it be to a hospital's operations for example? Is it a case of management isn't aware it exists or do they simply not know how to address it?

I think that there needs to be a lot of education and actually the next step after developing very good tools to assess ageism would be to test different messages to counteract ageism. Perhaps there are going to be messages across cultures so different types of healthcare providers will have to receive different types of educational materials and target them to specific markets.

But, I think that awareness is not enough because people might be aware of being ageist, yet they might think that this is justified. There needs to be more than awareness and education on the impact of ageism. People need to understand that unlike the other two -isms, sexism and racism, ageism really affects each and every one of us. We all have an age and that is why ageism has to be in the best interest of the entire society to fight. We are not there yet but I think that is the message that people should internalise in order to eventually fight and address ageism.

### If healthcare management/personnel aren't more aware of ageism, what problems could they face five or ten years from now?

I hope that it will become illegal to discriminate against people based on age. We know that there are many rules

and regulations that allocate rights and responsibilities to people based on their age. I think that if we managed to change that so that ageism becomes illegal, then there will be some consequences to that. We are at the beginning of a revolution. Just like in the 60s there was the feminist revolution, now we are at the beginning of the revolution of anti-ageism. ■

## KEY POINTS



- Ageism can manifest in a variety of settings not just within the healthcare system.
- Healthcare ageism can have a detrimental impact on delivering effective care.
- Educational interventions and inter-generational contact can be effective in reducing ageism.
- There are currently no measures, with good enough psychometric properties, to assess ageism.
- The way in which people think about their own ageing can impact their health.
- There needs to be more awareness on the impact of ageism.



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# Secrets of Longevity The IKARIA Study

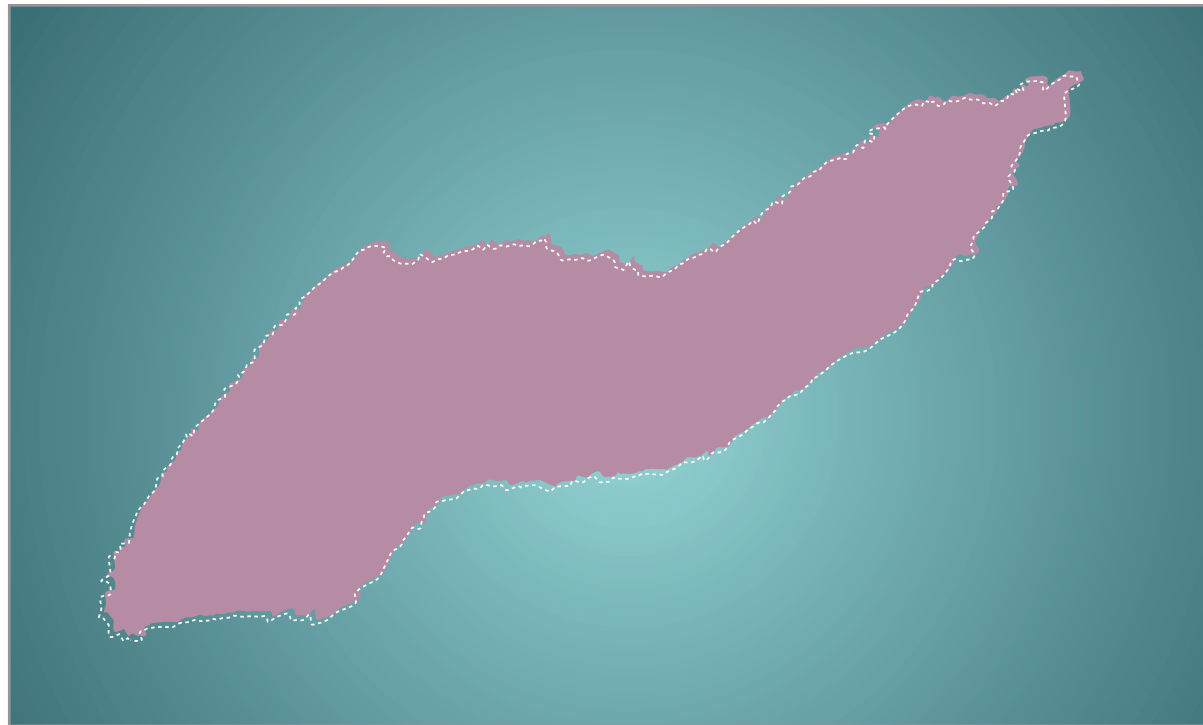
Summary: The intriguing finding of longevity among the Ikaria inhabitants was the impetus to perform an epidemiological study. Motivated by the IKARIA study, proposed measures of approaching the goal of longevity through delay of cardiovascular ageing will be discussed in this article.



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From the ancient years up until the contemporary societies, the achievement of a long and healthy life has always been the first priority of the human kind. In the last years, there have been important announcements about the longevity records around the

world. The so-called 'Blue Zones' are the five places in the world with the highest percentage of octogenarians. Among them, Sardinia, Okinawa in Japan, Loma Linda in California, Costa Rica and the Greek island, Ikaria share the precious gift of longevity. The intriguing

finding of longevity among the Ikaria inhabitants was the impetus to perform an epidemiological study in the island, aiming at investigating the genetic, phenotypic and environmental characteristics that may have contributed to the high longevity rate. Motivated by the IKARIA study, proposed measures of approaching the goal of longevity through delay of cardiovascular ageing will be discussed in this article.

## Nutrition

The beneficial effect of the Mediterranean diet on cardiovascular and holistic health has been highlighted by several studies in the past. In the IKARIA study, in a sample of elderly subjects above 80 years, a significant adoption to the Mediterranean diet was observed (Panagiotakos et al. 2011). Indeed, the dietary habits of the octogenarians included an increased consumption of olive oil (5-7 times/week), fruits (4-5 times/week) and vegetables (4-5 times/week), moderate consumption of fish (2 times/week) and mild consumption of red meat (1-2 times/week). Moreover, the Mediterranean diet was associated with low levels of uric acid, while the fish consumption was favourable for the kidney function (Chrysohoou et al 2011; Chrysohoou et al. 2013). Fish are enriched in polyunsaturated fatty acids, which exert antioxidant

and anti-inflammatory properties that may explain, at least in part, the beneficial effects of fish consumption on cardiovascular and renal health. To strengthen the above, a recent study showed that moderate fish consumption, one or more times per week, is associated with lower cardiovascular mortality compared to the rare consumption, less than once in a month (Owen et al 2016).

The dietary habits of Ikaria inhabitants also included a moderate consumption of wine and coffee. The main constituents of wine are polyphenols; interestingly, the predominant polyphenol, resveratrol, is associated with longevity through the activation of AMPK and sirtuins. Furthermore, resveratrol is a powerful antioxidant and an inducer of endothelium-dependent vasodilatation via increased NO synthase. It also improves mitochondrial function and reduces cardiac fibrosis, thereby favouring cardiac function.

Similar to the beneficial effects of wine, coffee is also favourable for cardiovascular health. In the IKARIA study, coffee consumption was associated, in a dose-dependent manner, with improved endothelial function, as this was assessed by flow mediated dilation (FMD). Moreover, those who consumed Greek coffee had significantly increased FMD compared to consumers of other types of coffee (Siasos et al. 2013). Polyphenols that enrich coffee, such as chlorogenic acid and its metabolites (caffeic and ferulic acid) may improve vascular function by decreasing the ROS production, increasing the NO bioavailability and exerting an antiplatelet effect. Most importantly, coffee consumption is related to reduction of all-cause mortality (Gunter et al 2017). To conclude, Mediterranean diet, in which coffee consumption should be included, is beneficial for cardiovascular and total health, thus promoting longevity.

## Exercise

Apart from the beneficial effects of the Mediterranean diet on health and longevity, exercise is also pivotal for increased lifespan. The elderly Ikaria inhabitants reported moderate physical activity, a feature that was common among inhabitants from the blue zone of Sardinia. Moreover, in IKARIA study, the endothelial function, assessed by FMD, was significantly improved in middle-aged subjects who reported regular exercise, compared to those who did not exercise, whereas FMD in middle-aged, physically inactive, inhabitants did not differ compared to the elderly subjects who exercised, a finding suggesting that exercise may ameliorate the adverse effects of ageing on endothelial function (Siasos et al. 2013).

"MEDITERRANEAN DIET, IN WHICH COFFEE CONSUMPTION SHOULD BE INCLUDED, IS BENEFICIAL FOR CARDIOVASCULAR AND TOTAL HEALTH, THUS PROMOTING LONGEVITY "

Exercise exerts beneficial effects on several ageing-related diseases, such as diabetes mellitus and arterial hypertension while its contribution to the reduction of cardiovascular and total mortality is of paramount importance. Long before the current scientific evidence, the greatest Ancient Greek physician and father of clinical medicine, Hippocrates (460-377 B.C), had underlined, for the first time, the favourable effects of exercise by writing: *"If all organs of the body function properly, at a moderate fashion, and if they exercise, they will remain healthy, they will grow-up*

*normally and they will age slowly. On the contrary, if they remain inactive, then they become vulnerable to diseases, they do not grow up normally and they age faster."*

## Socioeconomic Status and Psychological Factors

Data from the IKARIA study demonstrated a potential beneficial role of partnership and marriage to the long living of Ikaria inhabitants. Among the elderly subjects, the marital status exceeded 85% in men and 80% in women (Panagiotakos et al. 2011). Recent and previous studies have established a favourable effect of a happy marriage on the reduction of cardiovascular mortality. It is of note that marital status has shown to be a more powerful determinant of low mortality compared to financial status. In line with the above, in the IKARIA study, the majority of the octogenarians reported low income. Hence, a happy marriage might serve as a firm substrate for longevity.

Regarding evidence from the IKARIA study, low levels of psychological stress and depression were common among elderly inhabitants, a finding that might explain part of their longevity (Panagiotakos et al. 2011). Indeed, in a meta-analysis investigating the role of psychological stress on mortality, a dose-dependent relationship was established between stress and cardiovascular and all-cause mortality (Russ et al. 2012). Contrary to psychological stress and depression, positive feelings contribute to the reduction of mortality. A large, longitudinal study demonstrated a significant reduction of 17-25% in all-cause mortality among participants who reported high enjoyment of life compared to the non high enjoyment group (Zaninotto et al. 2016).

## Aortic Function

Aorta is the largest, elastic-type artery of the human body that, due to its elastic properties, ensures the laminar blood flow into the peripheral organs, thus preserving the integrity of microcirculation. As age progresses, changes in structure and function of the aorta are evident concerning, predominantly, the alterations in the two main constituents of the media, collagen and elastin. Indeed, ageing is related to degradation of elastic fibres and recruitment of the stiffer collagen fibres. Age and arterial blood pressure are the most significant determinants of aortic stiffness. The importance of aortic stiffness lies in its prognostic value given that aortic stiffness is an independent risk factor of cardiovascular events, cardiovascular and all-cause mortality (Vlachopoulos et al. 2010).

Interestingly, the effect of age on aortic stiffness was blunted among Ikaria inhabitants. Indeed, after the age of 50 years, pulse wave velocity, a direct marker of aortic stiffness, was significantly lower in Ikaria inhabitants, compared to the reference population, a finding that may imply lower vascular age with important clinical implications for cardiovascular health and longevity (Pietri et al. 2015).

## Longevity: The Past

The first report on longevity comes from a Bishop, almost 400 years before the identification of the 'Blue Zones' (Pietri et al. 2017). Joseph Georgirenes, Arch-Bishop of Ikaria-Samos, in a book published in 1677, described, for the first

time, the unique phenomenon of longevity in Ikaria island highlighting the role of favourable environmental conditions, Mediterranean diet, exercise and positive feelings: *"The most commendable thing of this island is the air and water, both so healthful that the people are very long lived, it being an ordinary thing to see persons 100 years of age, which is a great wonder, considering how difficult lives they live."*

Long before the identification of the 'Blue Zones' and the contemporary epidemiological studies, Joseph Georgirenes describes factors that favour cardiovascular health and may also promote longevity, such as diet, exercise, environmental conditions, a favourable genetic background and a healthy psychological status. ■

## KEY POINTS

- The 'Blue Zones' are the five places in the world with the highest percentage of octogenarians.
- Mediterranean diet is beneficial for cardiovascular and total health, and promotes longevity.
- Exercise exerts beneficial effects on several ageing-related diseases, such as diabetes mellitus and arterial hypertension and contributes to the reduction of cardiovascular and total mortality.
- A happy marriage might serve as a firm substrate for longevity.
- Factors that favour cardiovascular health and promote longevity include diet, exercise, environmental conditions, a favourable genetic background and a healthy psychological status.



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# FrailSafe System: An Innovative Approach on Frailty

Summary: Frail older people are often burdened with a range of complex medical conditions that leave them more susceptible to illness. The FrailSafe system aims to resolve this by offering a method that can predict, detect and manage frailty earlier on.



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Frailty is a clinical syndrome manifested with progressive deterioration in more than one physiological systems and is associated with weakness, instability, low resilience to stressing factors, falls, hospitalisations and mortality (Fried et al. 2001; Walston et al. 2006).

The syndrome constitutes a challenge in modern clinical settings due to its insidious progress, high prevalence among older adults, multiparametric effect and the lack of consensus to clearly define its clinical manifestations (Buckinx et al. 2015; Clegg et al. 2013; van Kan et al. 2010). Recent research has proposed that the impact of frailty is closely dependent to an individual's functional reserve, described as intrinsic capacity (WHO 2017), as minor adverse events (ie a fall) often have disproportionate effects in certain individuals.

The most effective way to address frailty in modern care involves frequent and in-depth examinations of nutritional, physical, medical, psychological, cognitive and everyday functioning domains (Fulop et al. 2010) which, undoubtedly, bears a significant burden for older adults and their families. Hence, in modern healthcare, frailty is often mis/underdiagnosed or addressed at a later and, often, not reversible stage.

The FrailSafe system was developed in the context of the EU funded FrailSafe study (Horizon 2020) to address the frailty syndrome and the challenges associated with

its prediction, prevention, early on diagnosis, monitoring and management. The FrailSafe system proposes a solution combining modern technology, such as wearable sensors, serious games and deep machine learning techniques, and traditional standardised instruments, to provide a holistic, continuous and multiparametric assessment of health status. The system is user-friendly and implementable in real-life settings to enhance user adherence and acceptance. In particular, in the basic user scenario, the older adult uses the FrailSafe system in their home-setting by wearing a specially designed vest, to measure their heart rate, systolic and diastolic pressure, breathing rate and stability. Also, developed applications installed in the user's smartphone or smartwatch record indoor and outdoor activity, to promote mobility and detect irregular motion patterns. Furthermore, a platform with serious games is provided in the user's preferred gateway (tablet, smartphone, etc) with the two-fold aim to detect deviations (diagnostic tool) and provide training (rehabilitation tool) in multiple cognitive and physical domains, such as working memory, calculation, orientation, balance and grip strength.

All collected data are transmitted in real-time on an online platform and are available to older adults, authorised family members, caregivers and doctors. The FrailSafe platform creates an individualised Virtual Patient Model (VPM) for each participant, according to their characteristics, measured parameters and health

data. The VPM offers the context for individualised interventions aimed to prevent and manage frailty and health deviations by taking under account the differences between subjects, in terms of performance, characteristics and resilience to adverse events. For example, parameters fed into the VPM are automatically utilised in serious games to offer a dynamically adaptable experience according to the users' strengths and limitations.

The high levels of integration in the system make it feasible for all involved parties to receive alerts, in case that an alarming situation for health is detected, such as instability, fall, loss of orientation, high blood pressure, low levels of physical activity, high body mass index, etc. Also, older adults and authorised caregivers can receive recommendations for health improvement, in case an abnormality is detected in some health domain.

Furthermore, the Frailsafe team has developed a predictive algorithm, which was incorporated in the FrailSafe platform to analyse the collected data and predict the probability of a future adverse event, such as a fall or a hospitalisation. Hence, the FrailSafe system offers a holistic solution for the detection of health deviations early on and the prevention of health deterioration. Finally, the study developed a Virtual Community Platform (VCP), where stakeholders can exchange opinions and experiences on frailty



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management. The VCP functions as a conventional forum and is an open virtual space, but focused on frailty and related diseases. The integrated FrailSafe system complies with ethical standards offering high levels of security and anonymity of users' data, as well as, the option for users to request full erasure of their data or revoke authorisation of their caregivers if deemed necessary.

The results of a six-month proof of concept study with the FrailSafe system were very optimistic showing that the FrailSafe system is a promising instrument in addressing, delaying and preventing frailty. In detail, older adults who used the FrailSafe system, presented improved mental and physical capacity in several measures and lower frailty transition rates, compared to peers belonging to the control group. Preliminary findings from the FrailSafe study evaluation show that the system is acceptable and desirable by older adults, caregivers, healthcare professionals, researchers and commercial stakeholders. All stakeholders stated that the system would contribute to their quality of life or current practices by offering a user-friendly and valuable complementary tool.

The FrailSafe system aims to fill a gap in modern healthcare and complement current practices by offering an innovative paradigm to predict, detect and manage frailty early on. The system bears significant benefits for the older adult as it delays frailty and promotes active ageing, IT literacy, social inclusion, self-confidence and sense of security in executing everyday activities. The enhanced efficiency in prevention, monitoring and

management of health are associated with reduced personal costs for acute management of diseases (ie hospitalisations and surgeries) and an overall benefit in national health expenditure for older adults, considering reduction in waiting times, better treatment of chronically-ill patients, more efficient practices, reduced working hours for healthcare personnel, etc. Improved healthcare services for older adults contribute to a significant benefit from a societal perspective.

Active and healthy ageing is associated with higher levels of social inclusion, employment, and engagement in social activities (ie volunteering, consulting services, childcare) and thus, hold the key for financial competitiveness. Statistics suggest that approximately 10% of older adults are still in the workforce (Casey 2002) a percentage significantly hindered by frailty and disability. Furthermore, the delay of frailty reduces the physical and psychological burden for informal caregivers, the environmental cost stemming from medical materials and the overall quality of life among older adults.

Future studies are planned to further support, replicate and reinforce the effectiveness of the FrailSafe system in real-life settings, in order to effectively tackle and offer a robust solution to the challenge of frailty. ■

## KEY POINTS



- Older adults with frailty, often, experience impairments in multiple physiological and medical domains including mobility.
- The Frailty syndrome constitutes a challenge in modern clinical settings.
- The most effective way to address frailty involves frequent and in-depth examinations.
- The FrailSafe system was developed in the context of the EU funded FrailSafe study to address the frailty syndrome.
- The FrailSafe system offers early diagnosis, monitoring and health management.
- The system is user-friendly and operates in real-life settings to enhance user acceptance.
- The system offers significant benefits to older adult as it delays frailty and promotes active ageing.



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# SILVER TSUNAMI

2030

## AGEING POPULATION - KEY FACTS

2050

The healthcare system will have to deal with twice as many hospital admissions and physician visits for baby boomers by 2030.

The Office of Disease Prevention and Health Promotion projects that by 2030, 60% of the baby boomer generation will be managing more than one chronic condition.

Source: <https://iii.hm/yhc>, <https://iii.hm/ygx>

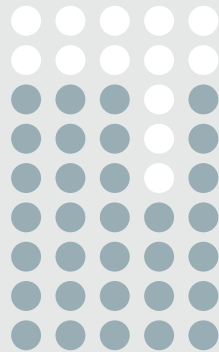
Today, there are 617 million people aged 65 and over. This number is projected to grow by nearly 17% to 1.6 billion by 2050.

By 2050, the number of people 65 years or older will outnumber children younger than 5 years of age.

## IMPLICATIONS OF AN AGEING POPULATION

- Increase in healthcare spending
- Increase in demand for care
- Increase in resource requirements
- Shortage of healthcare professionals
- Increase in burden on the working-age population

Source: <https://iii.hm/ygx>, <https://iii.hm/ygy>



## DISEASE AREAS AND THE AGEING POPULATION

- 1 Cancer
- 2 Dementia
- 3 Increased Falls
- 4 Obesity
- 5 Diabetes

Source: <https://iii.hm/ygx>

## POSSIBLE SOLUTIONS

New technology

Increased training of healthcare workers

New approaches to healthcare delivery

Providing preventive versus reactive care

Implementing a multidisciplinary care system

Source: <https://iii.hm/ygx>

*"They may forget your name, but they will never forget how you made them feel."*

Maya Angelou

## LESSONS FROM AGEING NATIONS



**Japan** and **Germany** have achieved top-ranked health outcomes with easy access to care and no waiting lists.

**Both** countries rely on competition in the hospital care sector, user fees for necessary medical services, and a parallel private health care sector.

Source: <https://iii.hm/ygy>

## THE AGEING DILEMMA

Physicians are ageing along with the population as a whole which will likely result in a gap in demand and supply in healthcare.

Source: <https://iii.hm/ygy>



# Game-Changing Meeting of Minds: Radiology and Imaging Informatics

A visionary radiologist explains how the European Society of Medical Imaging Informatics is bringing imaging and informatics together for best practices and patient outcomes.



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### What is the mission of the European Society of Medical Imaging Informatics (EuSoMII)?

Today, everything is related to the development of Artificial Intelligence (AI) solutions. This is a really hot topic and stakeholders are looking for the correct way to implement this technology. There are many possibilities with the application of AI in radiology. On the one hand, there is a huge volume of images and data available and, on the other hand, there are a great number of AI developments. However, data is not being shared with AI developers. This is the conflict between research and commerce too: data is currently mainly being used for research in the hospital/institutions and data needed for commercial products is much more difficult to obtain. A new market is developing, including companies specialised in curating this data. In healthcare, the majority of and most important AI solutions are the models being implemented in medical imaging. This makes sense as deep learning took off in image analysis.

The demand for medical imaging is increasing and the workload is rising, so we need solutions to facilitate a more efficient workflow. In short, we need technology and other tools that can assist us in analysing images more accurately and quickly.

There is a lot of interest from the computer scientist and software engineer side in AI, which is

clearly visible in the research arena, but they don't really know how this can be implemented in the real world of radiology. The research setting is totally different from the clinical work environment.

EuSoMII brings radiology and informatics professionals together to exchange knowledge and expertise and to join the forces of these specialties for better healthcare. Uniquely, we don't just have radiologists among our members but other experts in the field such as clinical physicists and computer scientists.

We also give members the chance to increase their networks beyond the clinical and informatics fields.

### How is EuSoMII bringing healthcare and technology stakeholders together to improve cooperation for better radiology work processes?

Our main objective is to help radiologists become more acquainted with imaging informatics in its broadest sense, including AI, and to teach them how to use it to optimise their services. Experts in the field are providing training and insights. At our annual meeting, we invite speakers from different disciplines and hold scientific sessions to show what is being developed in research. We address the difficulties, pitfalls and, importantly in this age of data protection, ethical and

legal issues. We also organise classes about how to use and even develop AI solutions for clinical practice. It is essential that radiologists are informed about what tools are available to make use of their own data for creating custom-made AI-solutions, without the need to learn any software developer's skills. Because the ability to do that will certainly facilitate the introduction of AI into radiological practice. That way they will be able to develop products which are optimally adapted to the local needs.

### What AI training routes is EuSoMII offering?

Radiology is split up into subspecialties based on different body areas. We could say that imaging informatics has also become a subspecialty. In this era of AI, there are (and will be) more and more tools we can use to analyse and evaluate data. When you start using this, you have to know what is happening with the data and how it is being processed. You really need some basic knowledge – as much as you need knowledge about an MRI machine that you are using to examine the body. As much as every radiologist should be able to detect the MRI “artefacts” that can occur by knowing the basic physics of the technique, they should be able to know where AI-tools can go wrong and what the underlying reason is. For this reason Charles Kahn, editor of the RSNA Journal on AI is asking the developers to produce “explainable



### What leadership skills do radiologists increasingly need?

Better-integrated informatics will lead to more targeted treatment, adhering to the principle of personalised medicine. This linking of patient genomic data and imaging is known as radiogenomics, which is the direction in which medicine, including radiology, is going in long-term. The more accurately we are able to analyse the data being provided through imaging, the more accurately we will be able to see how a disease is evolving.

In this framework, radiologists are increasingly involved in multi-disciplinary meetings, so solid leadership skills will be needed in supporting the integration of all patient related digital data and in using this data so that, for each patient, we will be able to advise our colleagues concerning the best treatment path to follow.

### What could radiologists learn from other sectors or hospital specialties about AI development and application?

First of all, other hospital specialties could learn from radiology. The more standards you have, the easier it is to use data. Like radiologists, dermatologists and ophthalmologists also use a lot of images, but they don't yet have standards for organising, sharing and archiving. Radiologists have refined standardisation and can share their experience.

If you look at what imaging could learn from industry, I can give an example of a Belgian company that is very active in image analysis in multiple sectors. It works in agriculture, automotives and smart city sectors. In farming, it has robotised tools to sort the good produce from the bad. This company is looking at how they could use this software in the medical sector. Techniques similar to those they developed for agriculture and successfully implemented for selecting and categorising different plants, can be applied to

analysis of medical images. They have already developed a tool to automatically segment kidney tumours on CT images of the organs for example. This way radiology can learn from technologies that have already successfully been applied in other sectors.

### How do you see the role of the radiologist changing in the future?

Radiologists will have to become more data-savvy and gain more skills in using all available image and patient data. They will move in the direction of data analysts. Now, we are still merely looking at morphological findings. But we are not doing enough with the other data that we have available to examine a lesion. How can we get more information an abnormality than just the morphology? How can we see if a tumour is active or inactive, malignant or non malignant? Through optimal integration of imaging informatics for analysing the data, our diagnoses will be more accurate and our treatment pathways personalised for the patients. We will also have to familiarise ourselves with the concept of patients able to use their own health data and other types of services directly offered to patients for analysing those data, which means that there will be other players active in the healthcare market that probably might compete with radiologists, which by some could be perceived as a threat of the profession. Therefore, radiologists will need to be proactive and cut off the road of those competitors by actively engaging with the new technologies.

### How will the field develop over the next decade?

AI will have a serious impact on the medical profession and, along with other medical specialists, radiologists will have to reevaluate their role. How will we integrate and how should we invest in these new developments, both from a knowledge and financial point of view? The demand for medical imaging is continuously growing and in several countries there is already a capacity problem for performing

systems" (explainable AI or XAI), making it possible to understand the rationale behind the results produced by these tools (Kahn 2019a).

In our events, seminars and webinars, we're focusing on the necessary skills for radiologists to become more familiar with imaging informatics and show that you don't need to be a computer scientist to understand and work in this area. We are also cooperating with the European Society of Radiology on the curriculum content. Owing to EuSoMII efforts, Imaging Informatics has now been included in the European training curriculum as a subspecialty. This means that we have to provide content to train residents in becoming experts in imaging informatics.

It won't be necessary for every radiologist to learn but, in each department, there should be at least one Imaging Informatics expert, otherwise it will be missing the tools to go ahead and invest in the future.

and reading all examinations. AI-tools are needed to assist radiologists in dealing with this increasing workload. An essential task for AI-developers will be to provide tools that can help radiologists in prioritising the reporting of those examinations in which life-threatening abnormalities can be found, such as pulmonary emboli for example.

There are not enough radiologists to do all of our image reading. In breast cancer screening for instance, there are always two reads. In the future, maybe the first read will be done by AI which will facilitate the radiologists in dealing with the large volumes of mammograms that need to be dealt with by filtering out the normal cases and offering them only the highly suspicious cases for validation.

Think of Moorfields Eye Hospital in London. They are collaborating with DeepMind, Google (Suleyman 2018) on

patients with diabetes. They are currently developing an algorithm to analyse these scans automatically because, each day, 1000 of these scans are being made, which makes it very difficult to leave this to the ophthalmologist himself/herself. This is a huge number so many tasks will be automatised to facilitate better service to patients, reduce waiting lists and make diagnoses more accurate.

### What can healthcare and AI stakeholders expect from EuSoMII in the future?

Our next objective will be to develop cooperation on an international level. We will cooperate more intensively with other societies such as the Society for Imaging Informatics in Medicine (SIIM) and will also increase our importance in assisting other subspecialty societies. Alongside this, we are

focusing on our educational role and advisory role in imaging informatics and all its related aspects. For example, we have just contributed to a major international, multi-society paper on the ethics of AI for radiology, which will most likely be published this autumn in several major radiological journals (Kahn 2019b). ■



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Continuation from p.385

key success factors for real innovation in the hospital sector. I want to identify three factors, as follows, that need to be addressed with particular attention in the Belgian context.

### Speed of Innovation

We are struggling with the lengthy period needed to develop, make decisions on, and implement reforms in healthcare policy. This is not only a responsibility of state structure or political decision-making, but also an issue of our healthcare sector system as a whole. Stakeholders and decision-makers are convinced that we need change, but when we try to operationalise, decide on and implement change, we encounter multiple hurdles and these cause us to lose time. I am not convinced that today we are moving forward quickly and efficiently enough to ensure that our healthcare system will be future-proof in time.

### Long-Term Thinking

In comparison to Singapore, where, according to Prof. Fidelis, health authorities are thinking up to 100 years ahead, we are lucky if we can think a legislature of maximum five years ahead. For innovation to be successful, we need to give these changes time to happen, however, we need to know where we will be in 20 or more years. It is essential that we learn to look as far forward as possible.

### Mindset

Even if challenges are multiple and complex, as Dr Stoffels said, 'It can be done.' Western Europe and countries like Belgium have a great deal of well-developed policy structures and social security mechanisms. These are clearly under pressure and this requires policy updates. But we do dispose of so many resources to face these challenges successfully.

We need to believe it ourselves and act upon it. Let me be clear that as a regulator we are ready to tackle all of this together with you. Let's innovate and build our future together. ■

### KEY POINTS



- Healthcare has always faced operational, financial and staffing challenges; the key is how to face them with an innovative mindset.
- Policy and healthcare sector red tape is frustrating innovation to a degree that could abort attempts to transform the industry.
- We need to look a minimum of 20 years ahead to innovate effectively now in healthcare.





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# Image Information Delivery in the AI Era: Two Likely Scenarios

Summary: As the world enters further into the transformative power of technology, Stephen Baker questions how this information revolution, in particular, AI will affect the capabilities available to industry experts.



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**M**any fields of knowledge, dependent on technology, can experience abrupt, massive growth as new techniques and novel forms of organisation come on stream and become incorporated within the standard canon. Radiology experienced this phenomenon in the 1980s in response to the nearly simultaneous introduction and deployment of cross-

sectional imaging modalities, CT, US and MR, and advances in interventional procedures which together broadened the specialties' reach and deepened its insights into diagnosis and treatment. These coordinated boons to patients and to radiologists enlarged our volume of work but only marginally altered the way we transmitted our expertise to referrers. Those

innovations were well accepted and, for the most part, were well accommodated within the established function of radiologists as primarily consultants to other physicians, not as direct communicators with patients, with the exception of course of mammography and angiography.

Now, we have entered into a second transformative practice paradigm, one both profound in the enhancement of capabilities and disruptive to the transmission of expertise. It will not only improve diagnostic capabilities but it will also alter the relationship of radiologist to referrers and even the very status of the radiologist in the care-giving enterprise. I refer of course to the imposition of Artificial Intelligence (AI) to imaging. The growth of machine learning applied to pattern recognition has been rapid, both in its comprehensiveness for particular conditions and for its widening application to most examinations under Radiology's purview. The attention now given to it is not merely a parochial one confined to physicians and their practices but rather it is also of interest to health administrators, policy analysts, and to the general public. The implications of its enlarging presence are societal and economic as well as medical. Not only have we established a radiology journal dedicated to AI but also in the U.S., for example, it has become a key component of the agenda addressing health care resource allocation.

Coming to grips with the implication of its widespread deployment is hard to measure and for some even to comprehend in this the incipient phase of what has been rightly labeled an information revolution. Early on with such a formidable change lurking, it is characteristic of those wedded to pre-existing models to deny with disdain something so radical. Others have looked upon it as a welcome addition to our customary functions, a tool to add to our diagnostic armamentarium, fully under the control of radiologists. But the disquieting evidence continues to accumulate that AI recognition of (1) the presence or absence of abnormality, (2) the patterns of disease and normalcy and (3) when findings are present with their extent, multiplicity and/or singularity exceed conventional capabilities of even the most perceptive radiologist. AI will likely prove to be more incisive for spatial discernment than those of mere human readers – a fact that at this stage of development seems obvious and insistent.

## "THE GROWTH OF MACHINE LEARNING APPLIED TO PATTERN RECOGNITION HAS BEEN RAPID"

Now, of course, radiologists are not in jeopardy as providers of interventional procedures. And their expertise can be valuable as providers of decision support when needed, a function most often sought in ER and inpatient settings for patients with complex problems for which the sequencing of imaging examination plays a part in diagnosis and management. But, overwhelmingly, radiologists are “film” readers. Their interaction with referrers is standardised if not conventionally standoffish limited to test result opinion rendering transmitted unidirectionally and increasingly distant in place and, except for emergent requests, distant in time to varying degrees.

How soon will the AI revolution be completed? No one knows for sure but previous technological makeovers are often effectuated within ten or fifteen years. In the United

States the 1830s was the decade of canal building yet, by 1840 these new such ventures were largely abandoned, displaced by the rapid expansion of railroads. The first talking picture came on screen in 1928. Gone With the Wind appeared in 1939 when silent films had become just a memory. Radio dramas - soap operas - were very popular during and just after World War II. But, they too, rapidly disappeared from that medium and by 1957 almost all were transferred to TV.

Hence, we should suspect that both the medical and the general public will demand AI-rendered diagnoses within a decade. Where does that leave the radiologist? Two scenarios come to mind – each akin to temporally parallel advances in another mode of delivery – the transfer and receipt of purchased packages.

The first model corresponds to the semi-autonomous delivery system. Self-driving cars will be deployed to bring products from suppliers to consumers. But most likely the public, initially at least, will have persisting concerns about the safety of these conveyances when travelling on highways and byways. So, they will move along, at least at first, with a human inside them. A qualified rider will also be present to set things right if a wrong route is taken or danger appears. Analogously, an AI generated report will be inspected or otherwise overseen by a radiologist who will not read every study but will nonetheless put on the report his or her imprimatur to vouchsafe quality. But, most likely, as the AI generated interpretation is accepted as being standard, cost will be scrutinised and the compensation according to the radiologist as a QA monitor rather than an expert reader will be adjusted downward.

The second scenario for which the package delivery metaphor is also apt is one that will perhaps be more enduring. It could be labeled the drone delivery model. Here the AI interpretation will be sent to the referrers over an electronic “airway” without the radiologist’s immediate oversight. A fly-alone drone will soon be the means by which

purchases are sent to complete an order. The implications of this delivery mode are much more consequential for the radiologist than is the semi-autonomous vehicle delivery proposal. For with it, the radiologist can be effectively displaced becoming a supernumerary actor in the diagnostic encounter. And as such, a radiologist’s claim to lasting hegemony over imaging will be challenged. Moreover, as a consequence, their proprietorship of imaging modalities will be questioned. With this mode of information transfer, the oncologist or the orthopedist may seek to make the CT and MR machines they rely on become part of their equipment resources with all that that allocation of such ownership transfer entails.

I regret having to elaborate to some small degree such a dystopian prospect for my fellow radiologists. Yet technological advances are not necessarily sympathetic to long standing advantages hallowed by custom and comfort. I hope these two scenarios will not come to pass but that does not mean they should be ignored in the face of accumulating evidence for their realisation. ■

## KEY POINTS



- Industries dependent on technology are seeing abrupt change.
- Radiology has entered its second transformative phase.
- AI will have a profound effect on the expert’s competence.
- AI has become a key when addressing health care resource allocation.
- AI will change how radiologists deal with patients and their status within the workplace.
- It’s predicted that both medical and public will demand AI-rendered diagnoses within a decade.
- The radiologist could effectively become surplus to requirements.

# The Sex and Gender Influence on Hypertension

Summary: Despite underlying physiological differences and a different set of risk factors, diagnosis, management, and treatment strategies for hypertension do not account for sex and gender variances.



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Evidence-based guidelines for hypertension treatment from clinical trials are similar between males and females; however, most of these trials do not include any risk stratification of sex and gender (Wenger et al. 2018). Even from the start of medical education, students are taught a single set of risk factors and treatments to be applied to both sexes despite any underlying physiologic differences. The Center for Disease Control (CDC) estimates that 1 in 3 people have hypertension, and with half the population being female, the impact of not accounting for sex and gender variances can lead to poorer quality of care and worse outcomes.

## Risk Factors: How Important are the Sex and Gender Differences?

Although hypertension becomes more prevalent with age in both males and females, the timeframe of onset is unique for each. Hypertension rates in premenopausal women are lower when compared to men of the same age cohort (Muiesan et al. 2016) whereas, after age 50, women have a higher rate of hypertension than men (Benjamin et al. 2018). Regardless of gender, all people with hypertension are at an increased risk of developing cardiovascular disease (CVD). The differences, however, fall within the risk factor profile. For example, men tend to have the more traditional risk factors whereas women often will present with less traditional risk

factors (Tziomalos et al. 2014).

### Traditional Risk Factors

- Tobacco use
- Hyperlipidaemia

### Non-traditional risk factors

- Renal disease
- Abdominal obesity

In females, onset of menopause is associated with a 2-fold increase in the risk of HTN and increased cardiovascular risk (Barton and Meyer 2009). Blood pressure levels at this time depend on age and duration of menopause, suggesting oestrogen deficiency to be a contributing factor. After a woman undergoes menopause, she is found to have an elevated BMI as compared to before, as well as abnormal glucose metabolism (Nuzzo et al. 2010). These sex-related factors may contribute to the development of metabolic syndrome, which in turn leads to an elevated blood pressure and increased risk of CVD.

There are currently multiple hypotheses regarding why women have a unique set of risk factors for hypertension compared to men, the first of which involves the role of female sex hormones. While a female is premenopausal, she is benefiting

from oestrogen's protective effects. Oestrogen has been found to activate nitric oxide, leading to inhibition of the sympathetic system, thus causing vasodilation (Samad et al. 2008). Women have more arterial oestrogen receptors than men, and a premenopausal woman, who has the highest level of oestrogen production, is able to most benefit from the vascular effect (Tadic et al. 2019).

"THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY SHOWS A DISCREPANCY OF AWARENESS AND TREATMENT OF HYPERTENSION BETWEEN GENDER"

A second hypothesis regarding female-specific pathophysiology of hypertension suggests that a greater anti-inflammatory immune profile in women with hypertension may be a compensatory mechanism to limit increases in blood pressure. Evidence shows that ovarian hormones can reduce plasma renin levels and ACE activity, thus leading to decreased angiotensin 2 levels. Angiotensin type 2 receptors, which promote an anti-inflammatory profile, have greater activity in women (Lombardi et al. 2017).



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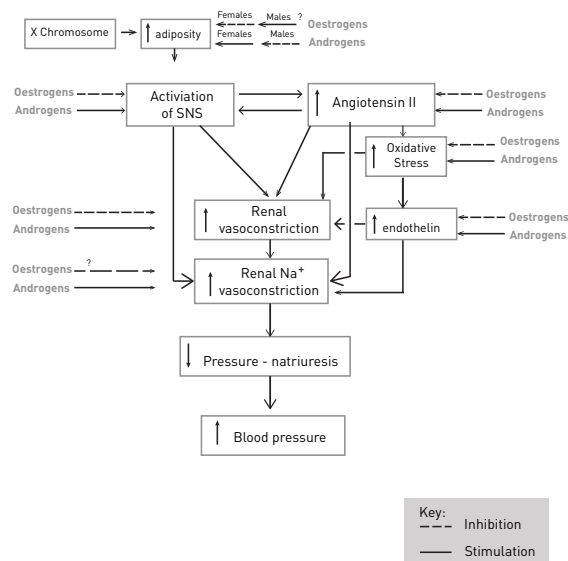
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## Diagnosis and Treatment of Hypertension

Current guidelines in diagnosis of hypertension require multiple office visits with elevated blood pressure. Menopausal women often have more fluctuation in blood pressure measurements than men, which can lead to a lower likelihood of positive diagnosis (Kagitani et al. 2015). Despite the differences in risk factors, there is limited data regarding gender-specific screening strategies for hypertension.

The National Health and Nutrition Examination Survey (NHANES) from 1999-2011 showed a



**Figure 1.** Mechanism by which oestrogen and androgens control blood pressure. Source: Maranon and Reckelhoff 2013.

discrepancy of awareness and treatment of hypertension between gender. Young adults, particularly young males, were found to have poorer control of hypertension compared to all other age cohorts and age-matched females. The NHANES study estimated a difference of 28% of improved hypertension awareness, 60% difference in treatment for hypertension, and a 52% difference in control of blood pressure in younger women. The incongruity is hypothesised to be due to more frequent healthcare visits by young adult women versus age-compared men (Zhang and Moran 2017).

In November 2017, the American Heart Association published new recommendations for blood pressure control and treatment. These guidelines were based off the SBP Intervention Trial (SPRINT), a 2015 study that reported intensive blood pressure control was associated with lower all-cause mortality compared to standard blood pressure control in patients with high risk of CVD. The results of the SPRINT trial were eagerly awaited to aid in creating updated guidelines, but there have been significant critiques of the study and how broadly it can be applied. The average age of the participants was 70, and just about 30% of the participants were women (Wenger et al. 2016).

Treatment targets of hypertension are not gender-specific, and men and women generally demonstrate similar responses to medication. In women, thiazide-type diuretics are the preferred first-line therapy due to the additional benefit of protection from bone loss and hip fractures (Mosca et al. 2011). If there are any other known comorbidities, the patient should additionally be treated with a

beta-blocker and an ACE inhibitor.

The side effect profile of antihypertensive drugs has been noted to vary between sexes. Women are 1.5-1.7 times more likely to develop side effects than men (August and Oparil 1999). With diuretic use, women are more likely to develop hyponatraemia, hypokalaemia, and arrhythmias. Women also more commonly develop ACE-inhibitor related cough and calcium-channel blocker-related peripheral oedema (August and Oparil 1999).

Physicians and researchers have previously considered the effectiveness of hormone therapy on blood pressure control. There have been multiple studies done with inconclusive results, some showing an improvement in BP control, some showing further increases and blood pressure, and some showing no effect.

REGARDS (Madsen et al. 2019) noted that increasing hypertension and incident ischaemic stroke was almost 2x more prevalent in women compared with men and suggested that blood pressure control and risk factor reduction utilise a sex-specific approach.

## Comorbidities, Mortality, and Other Considerations

The leading cause of death in the United States is heart disease, and the primary modifiable risk factor for heart disease is hypertension. Although a larger percentage of men (24.4%) die from heart disease than women (22.3%), women are more likely to develop adverse consequences as a result of their hypertension (Arias et al. 2013). For each

10 mmHg increase in SBP in women, there is a 25% increased risk of developing CVD. In men, the risk is only

## "BLOOD PRESSURE CONTROL AND RISK FACTOR REDUCTION SHOULD UTILISE A SEX-SPECIFIC APPROACH "

increased by 15% (Wei et al. 2017).

A study that analysed blood pressure control rates among hypertensive women with CAD showed that women who had a prior MI or revascularisation procedure were at a higher risk for stroke, MI, and death (Sava et al. 2019). These women were also women with elevated blood pressures and also more likely to develop left ventricular hypertrophy, diastolic dysfunction, increased arterial stiffness, diabetes, stroke, and chronic kidney disease (Wenger et al. 2018).

## Conclusion

Sex and gender are important facets of a patient's healthcare experience. Although there are numerous similarities in risk factors and treatment between the sexes, there are gender-related differences in underlying physiology and pharmacokinetics, as well as social and environmental factors, that can affect clinical

decision-making. Further research with an accurate representation of the general population is becoming more prominent, but without exploring these concepts with medical students, patients will not be receiving the

## KEY POINTS



- 1 in 3 people have hypertension and half of this population is female.
- Not accounting for sex and gender variances can lead to poorer quality of care and worse outcomes.
- Women have a unique set of risk factors for hypertension compared to men.
- Sex and gender are important facets of a patient's healthcare experience and must be considered to ensure best possible personalised care.



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# How the Brain Works: Looking Inside to Target Treatments

Summary: Groundbreaking study at the University at Buffalo uses brain stimulation to assess how large-scale patterns of brain activity could vary between cognitive systems and across people.



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Our research at the University at Buffalo explores brain activity and its association with cognitive systems. Each cognitive system consists of a network of brain regions that are linked to different functions. We use computational modeling to investigate how the brain works by mapping out the different regions of the brain and how they are connected in different people. In each subject's brain, a single region was stimulated. A mathematical framework then measured how brain activity synchronised across the various cognitive systems.

Understanding individual variability in brain networks is going to be increasingly important as we attempt to develop personalised medical treatment strategies. We need to know which parts of the brain are subject to more variability and we need frameworks that allow us to measure this variability. Our chimera framework allows for a quantitative assessment of which cognitive systems are more variable across individuals in their response to stimulation. Knowing that a particular brain region shows a highly variable response to stimulation across individuals can help clinicians as they develop a personalised treatment strategy and understanding how these patterns change in different diseases will be important future work.

Findings from the study confirm and extend knowledge of brain structure-function relationships. They also demonstrate that you can investigate critical cognitive states where a balance between integration and segregation is required for adaptive cognition. The

methodology was applied to brain networks derived from healthy individuals. Quantifying patterns of synchronisation in other populations and measuring the differences between what is observed in healthy populations might lead to further insight into how structural changes impact function.

In reality, neuronal activity patterns that are observed in the brain using different functional measurement techniques, such as functional magnetic resonance imaging (MRI), electroencephalography, magnetoencephalography, and positron emission tomography, are a result of a complex neurophysiological activity that develops on top of the structural connectivity infrastructure. We used computational simulations to perform in silico stimulations experiments and measure the resulting patterns of synchronisation. However, the cognitive-chimera framework is not limited to simulated data and could be applied to experimental data of all types.

Future research can extend the silico experiments to examine chimera states using experimental data, providing opportunities to enhance performance in healthy participants or individualise medicine in clinical populations. Brain stimulation is currently used as a treatment option for certain disorders (eg Parkinson's disease). It could be the case, that this framework could help clinicians identify new stimulations sites that drive brain networks into desired states or help clinicians understand why treatment isn't as effective in certain people. There's a lot that we still don't know about how

brain stimulation works, but our chimera framework allows us to start measuring the effects of stimulation and understand how variable it is across people and brain regions.

This study provides a way to quantify and describe patterns of partial synchronisation that are observed in the brain. We can use this framework to understand individual variability in healthy populations and to understand how different cognitive systems change their patterns of interactions in non-healthy populations.

The research was a collaboration between UB, ARL, Columbia University, the University of Pennsylvania, Carnegie Mellon University and the University of California, Santa Barbara. The study was funded under an Army Collaborative Technology Alliance ([cancta.net](http://cancta.net)). ■

## KEY POINTS



- Individual variability in brain networks is going to be increasingly important to develop personalised medical treatment strategies.
- This framework could help clinicians identify new stimulation sites that drive brain networks into desired states and also help clinicians understand why treatment isn't as effective in certain people.
- This framework provides a way to quantify and describe patterns of partial synchronisation that are observed in the brain.



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# New Management Pathways in Cardiovascular Risk Factors

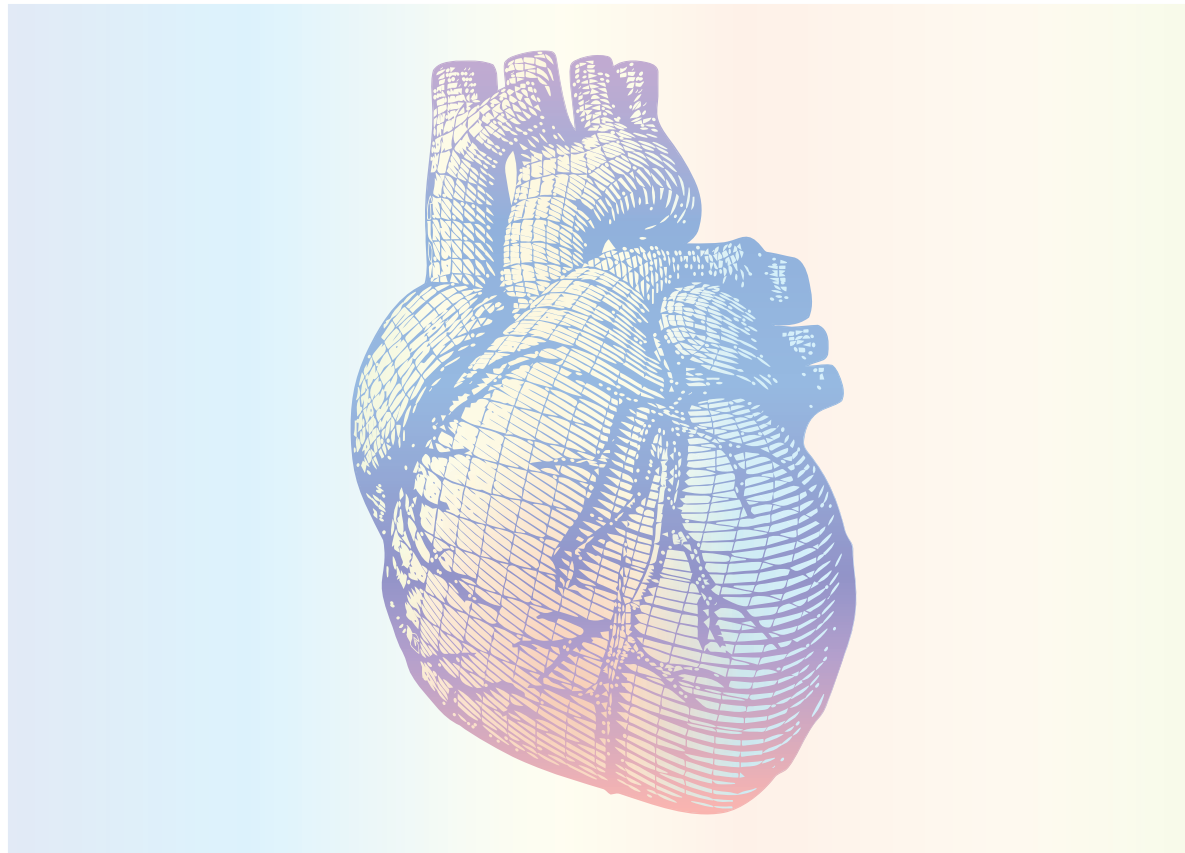
Summary: A presentation of a case study in light of the updated ESC guidelines on lipid control and new guidelines on diabetes and cardiovascular disease.



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Several new guidelines were released at the European Society of Cardiology (ESC) Congress in Paris, France. These included updated guidelines on lipid control and new guidelines on diabetes and cardiovascular disease.

As per the updated guidelines on lipid control, the following are some key recommendations (escardio.org):

- Low-density lipoprotein (LDL) cholesterol levels should be lowered as much as possible to prevent cardiovascular disease, especially in high and very high risk patients.
- There is no lower limit of LDL cholesterol that is known to be unsafe. Available drugs (statins, ezetimibe, PCSK9 inhibitors) should be used as effectively as possible to lower levels in those most at risk.
- As per revisions to the risk stratification categories, patients with atherosclerotic CVD, diabetes with target organ damage, familial hypercholesterolaemia, and severe chronic kidney disease will now be categorised as very high-risk.

In addition, new guidelines on diabetes and cardiovascular disease were also released during the



ESC Congress (escardio.org). The key recommendations include:

- Lifestyle changes are now advised to avoid or delay the conversion of pre-diabetes states, such as impaired glucose tolerance, to diabetes. Physical activity of at least 150 minutes per week is being encouraged to prevent/control diabetes and reduce the risk of cardiovascular complications.
- Moderate alcohol intake should not be promoted. Alcohol consumption does not appear to be beneficial, hence the change in recommendations
- Self-monitoring of blood glucose and blood pressure is advocated for patients with diabetes to achieve better control.
- Statins are not recommended in diabetic women of childbearing potential and should be used with caution in young people.
- GLP-1 receptor agonists and gliflozins should be used as first-line treatment in type 2 diabetes patients with established cardiovascular disease or at high risk of cardiovascular disease.
- Non-vitamin K antagonist oral anticoagulants, specifically rivaroxaban, should be considered in combination with aspirin for patients with diabetes who have poor circulation in the legs.
- PCSK9 inhibitors are advised for patients with diabetes at very high risk of cardiovascular disease who do not achieve LDL cholesterol goals despite treatment with statins.
- Overall, lifestyle advice for patients with diabetes and pre-diabetes encourages them to quit smoking, reduce calorie intake, and adopt a Mediterranean diet.

In light of these new and updated guidelines, Rafael Vidal Perez of Hospital Clinico Universitario de Santiago de Compostela, Spain presented a case study of a 50-year-old woman living in Spain. She had some measurements of elevated blood pressure but was currently not classified as a hypertensive. She had a family history of high cholesterol and coronary artery disease. The woman was a heavy smoker and worked in shifts in a nursing home. She was not taking any medication for BP or cholesterol but was on combined oral contraceptive pill. She was obese with a BMI of 31.2 Kg/m<sup>2</sup>.

### "LDL LEVELS SHOULD BE LOWERED AS MUCH AS POSSIBLE TO PREVENT CARDIOVASCULAR DISEASE, ESPECIALLY IN HIGH AND VERY HIGH RISK PATIENTS"

Could the woman be suffering from hypertension? Determining that was the next logical step. Results from ambulatory blood pressure monitoring and BP home readings confirmed that she suffered from hypertension.

The next important question to answer was this: what was the patient's cardiovascular risk using the latest ESC guidelines? She was obese and she had a family history of premature CAD. Based on this and her lipid profile and eGFR score, it was obvious that her cardiovascular risk was very high. ESC guidelines recommend systematic cardiovascular risk assessment in individuals who are at an increased CV risk such as those with a family history of premature CVD, familial hyperlipidaemia, major CV risk factors such as smoking, high BP, DM or raised lipid levels or comorbidities. On the basis of these recommendations, this patient was clearly a Class I, Level C patient who required a total CV risk estimation using a risk estimation system such as SCORE.

SCORE is an intuitive and easy to use tool that allows an objective assessment of risk and takes into account the multifactorial nature of CVD. The diabetes goes directly to high or very high risk in relation with organ damage and risk factors without using SCORE. In this case according to the guidelines she was a very high risk patient.

The next thing to address was this: on the basis of the new lipid control guidelines, what should be the current LDL-C goal objective and treatment strategy for this patient? She was under 55, obese with high blood pressure, high cholesterol and a family history of type 2 diabetes and CAD. The LDL-C objective is less than 55 mg/dL. She would require lifestyle advice and drug treatment under the updated ESC guidelines.

Through this case representation, Dr. Vidal Perez successfully demonstrated how the new lipid control and diabetes guidelines could be applied and implemented in clinical practice to achieve better control in patients who are at a high risk of cardiovascular disease. ■

## KEY POINTS



- Updated guidelines on lipid control and new guidelines on diabetes and cardiovascular disease were released at the ESC Congress this year.
- Low-density lipoprotein cholesterol levels should be lowered as much as possible as there is no lower limit of LDL cholesterol that is known to be unsafe.
- Lifestyle changes are advised to avoid or delay the conversion of pre-diabetes states to diabetes.
- Patients with diabetes and pre-diabetes are encouraged to quit smoking, reduce calorie intake, and adopt a Mediterranean diet.

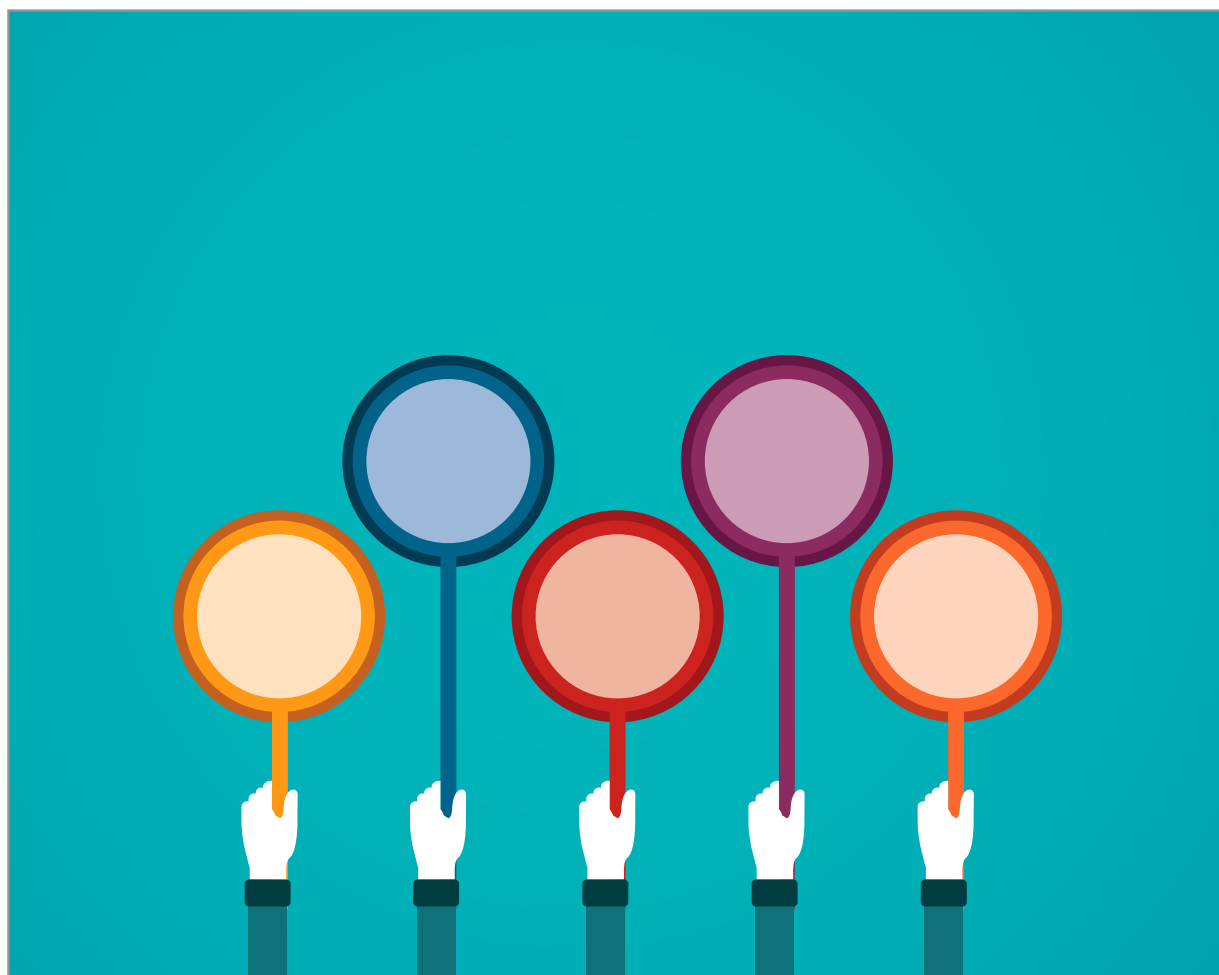
# Tackling the Five Essential Levers of Theatre Efficiency

Summary: In which areas can theatre departments instigate change for improved performance?



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Theatres are at the heart of delivering quality outcomes for patients by performing life-changing and life-saving operations. That makes maximising the use of this vital and expensive resource essential for hospitals' efforts to meet quality, operational and financial targets.

Nationally, theatre performance is mixed. They are under increased scrutiny from the regulators and initiatives such as Model Hospital and the GIRFT programme ([gettingitrightfirsttime.co.uk/](http://gettingitrightfirsttime.co.uk/)).

However, while theatre efficiency is a broad and complex subject, five key levers can be used to drive sustainable change and improvement.

## 1. Robust Accountability and Governance

Clear support and accountability are needed to achieve a shared vision, and clinical leadership is essential in an overarching robust governance framework. All stakeholders must be aligned around a core set of KPIs. These performance measures also need to be understood, in the simplest terms, from the Theatres teams up to the Trust Board. For example, it can be hard to really understand what improvement in theatres' utilisation means in reality when expressed as percentages, but showing how many more patients have been treated is far more

tangible, and more likely to create understanding and buy-in.

## 2. Better Alignment of Workforce to Demand and Capacity

Lack of demand and capacity plans, in our experience, is routinely the biggest driver of premium and temporary spend and failure to meet KPIs. However, demand and capacity planning is complex because the interdependencies across care settings (theatres, outpatients and wards) and performance against plans must be routinely monitored to ensure resources are optimised and supporting actions taken to realign the workforce. PA recently developed a Referral-To-Treatment (RTT) adjusted model that explores these issues at specialty, sub-specialty and consultant level and enables hospitals to align capacity in a way that can be easily adjusted and monitored as priorities change.

"CLEAR SUPPORT AND ACCOUNTABILITY  
ARE NEEDED TO ACHIEVE  
A SHARED VISION"

## 3. Automated and Efficient Scheduling

Effective theatres rely on well-structured lists to avoid over-runs and under-runs but, all too often, organisational inertia and resistance to change means scheduling and booking patterns have gone unchanged and unchallenged for years.

Artificial Intelligence (AI) can provide dedicated scheduling tools to build efficient lists and support the

achievement of RTT by selecting appropriate cases. However, effective scheduling can only be achieved through direct clinical engagement. By applying this approach to scheduling, using evidence-based insight from data and clinical teams, PA helped Leeds Teaching Hospitals NHS Trust to reduce early- and late-running theatre sessions by 105 and 30 hours per month respectively; whilst forecasting to deliver an extra 488 operations a year (PA Consulting 2019).

## 4. On the Day Problem-Solving

Plans change and the way teams respond to issues such as shortage of key equipment, limitations in staffing or beds, on the day - and in the moment - and learn from them is key. Improved feedback between the scheduling, operational and front-line teams is vital to tackle and learn from these. Equally, extra hands-on support (via consultancies) and a fresh pair of eyes can often deliver quick-wins and break down barriers to change.

## 5. Engaging Leaders with Insight

Engaging stakeholders with easy to understand insights from data is essential. Our Hospital Insights platform which provides an extensive range of key operational data in one place helped one trust identify that late-starts were the key issue when the accepted belief across the hospital was that late-finishes were the main challenge. The tool allowed us to rapidly identify repeat offenders within selected specialities, and through a selected set of interventions agreed across the theatres teams, reduce late starts by 18%.

## Conclusion

It is important to recognise that deploying just one or a subset of these five levers will not sustainably improve performance. Leadership teams need to be asking if their organisation is tackling all five levers to give them the best chance of delivering sustainable performance improvement. ■

## KEY POINTS



- To achieve a shared vision, accountability and clear clinical leadership in a robust governance framework are needed.
- Demand and capacity planning is dependent on factors across care settings and should be routinely monitored.
- Although AI can help with scheduling, effective scheduling can only be improved through direct clinical engagement.
- Improved feedback and communication is essential for ensuring that staff can deal with on the day problem-solving.
- Engaging stakeholders with easy to understand insights from data is essential.



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## SABESAN SITHAMPARANATHAN

FOUNDER AND CEO AT PERVASID, UK

### TOP QUOTE FROM THE BLOG

**'Three Ways Next Generation RFID Can Transform the Healthcare Sector'**

"The ability to track medical equipment with far more accuracy and in almost real-time, eradicates the time wasted by staff attempting to locate essential assets."

**See more at: <https://iii.hm/y99>**



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CHIEF MEDICAL OFFICER, GE HEALTHCARE, EUROPE

### TOP QUOTE FROM THE BLOG

**'Targeted Therapy for Cancer'**

"Going from an environment where everyone receives the same care pathway, but only some people have positive results to a world where people follow different care pathways, tailored to their needs, increases the proportion of people with positive results."

**See more at: <https://iii.hm/ybz>**



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### TOP QUOTE FROM THE BLOG

**'Zoom On: Mini Profile'**

"When it comes to health politics, healthcare will not work if the framework and political priorities do not match up with what is required to provide safe medical care."

**See more at: <https://iii.hm/y96>**



## DENNIS SPAETH

CEO/PUBLISHER - CUTTING TOOL  
ENGINEERING, CTE PUBLICATIONS, USA

### TOP QUOTE FROM THE BLOG

**'How Are Robots Improving Cardiovascular Medicine?'**

"Robotic technology has transformed the way we treat patients and conduct surgical procedures and future advancements in robotics will only make medical procedures and diagnoses even more efficient."

**See more at: <https://iii.hm/y98>**



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